APPENDIX A

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

Nos. 00-1533 & 00-1553

VULCAN ENGINEERING CO., INC.,
Plaintiff/Cross-Appellant,

v.

FATA ALUMINIUM, INC., AND FATA GROUP, S.P.A.,
Defendants/Appellants.

On Appeals from the United States District Court
for the Eastern District of Michigan

[Feb. 5, 2002]

Before NEWMAN, MICHEL, and LOURIE, Circuit Judges.

Opinion for the court filed by Circuit Judge PAULINE NEWMAN. Opinion dissenting in part filed by Circuit Judge MICHEL.

PAULINE NEWMAN, Circuit Judge.

Vulcan Engineering Company brought suit for infringement of United States Patent No. 4,736,787 ("the '787 patent") against FATA Aluminum, Inc., and FATA Group, S.p.A. (collectively "Fata"). Fata raised various defenses, and filed a counterclaim charging that the '787 patent is invalid. The United States District Court for the Eastern District of Michigan held, after a bench

trial, that the '787 patent was valid, enforceable, and infringed, and awarded damages of $2,187,199.[1] Both sides appeal aspects of the judgment. The judgment is affirmed, with modification of the damages award. We remand for accounting of modified damages.

BACKGROUND

The '787 patent, issued on April 12, 1988, relates to an on-line continuous system for the production of cast metal shapes using the "lost foam" process. The traditional method of casting of metal articles involves four general steps: (1) forming a mold by compacting the mold material around a model in the shape of the desired article; (2) cutting the mold open to remove the model and then resealing the mold; (3) pouring molten metal into the mold and allowing it to cool; and (4) breaking or cutting the mold to recover the cast metal article. Lost foam casting, first described in 1958, was a significant advance in that step (2) is entirely eliminated. Instead, a polystyrene foam model of the desired article is used to form the mold, and is not removed from the mold; then when molten metal is poured into the mold, the polystyrene foam is burnt out as the metal replaces the foam model.

Lost foam casting was practiced before the '787 invention, but the process was not automated and the steps were labor-intensive and entailed high production costs. It was believed that continuous automated procedures were not suitable, and none was available until Vulcan's development of the process that is the subject of the '787 patent. It is illustrated in patent Figure 1, which shows, *inter alia*, interconnected gondolas **19** moving through stations that perform the steps of loading and compaction 12, pouring of the molten metal 13, and mold unloading 14.

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[1] *Vulcan Engineering Co. v. Fata Aluminium, Inc.*, No. 98-74495 (E.D. Mich. Aug. 10, 1999) (validity and infringement); (Oct. 22, 1999) (denying new trial); (Aug. 1, 2000) (accounting).

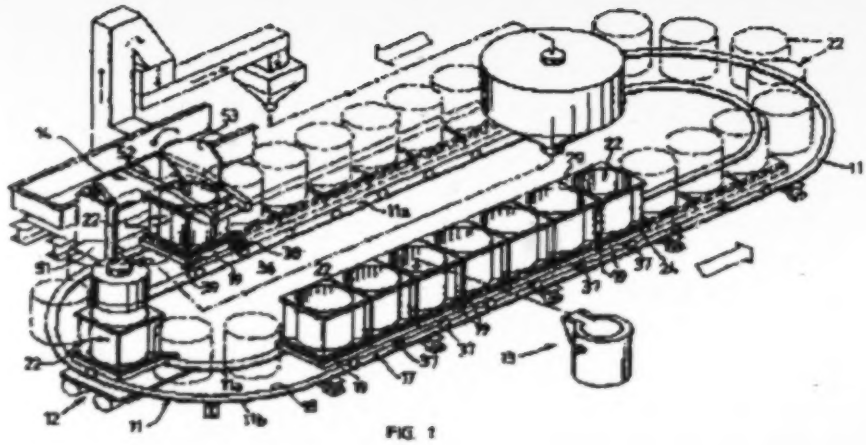

FIG. 1

Claim 1 is the broadest claim:

> 1. In a lost foam casting system, a closed curvilinear track means having a loading and compaction station, a metal pouring station and a mold unloading system;
>
> a plurality of flask carrying gondolas supported for movement along the track means with each gondola including means for registering said flask thereon for alignment in said compaction station, and with each of said gondolas being pivotally connected to each adjacent gondola;
>
> drive means for effecting intermittent movement of the mold carriers between indexed positions along said track means;
>
> and a plurality of mold forming flasks adapted for registry in said gondolas and detachably supported thereon.

The Vulcan system was reported with acclaim in trade publications.

In February 1997 Vulcan and Fata submitted competing bids in response to a solicitation by General Motors Corporation for nine metal casting lines by the lost foam method, meeting certain detailed specifications. Fata's

bid was lower, and General Motors awarded the contract to Fata. Vulcan then wrote to General Motors on August 6, 1997, stating that Vulcan believed that a system meeting the specifications of the bid would necessarily infringe the '787 patent. On August 12, 1997, General Motors sent Fata a copy of Vulcan's letter, reminding Fata of its contractual indemnification obligation with respect to patent infringement. Fata continued to work on producing the lines for General Motors, and Vulcan filed suit against Fata on September 15, 1998. Line 1 was delivered by Fata to General Motors in November 1998, and lines 2 through 5 were still being produced when in May 1999 the district court announced its decision that the '787 patent was valid and infringed. Following certain license arrangements between Vulcan and General Motors, damages were assessed. Both sides appeal.

I

VALIDITY

Fata challenged the validity of the '787 patent on several grounds.

Obviousness

Invalidity on the ground of obviousness is a question of law based on underlying factual findings. *See Graham v. John Deere Co.*, 383 U.S. 1, 17, 86 S.Ct. 684, 15 L.Ed.2d 545, 148 USPQ 459, 467 (1966). The district court's findings of fact are reviewed for clear error, and its statements of law and application of the law to the found facts are reviewed for correctness. *See Glaverbel Societe Anonyme v. Northlake Mktg. & Supply, Inc.*, 45 F.3d 1550, 1555, 33 USPQ2d 1496, 1499 (Fed.Cir.1995). A factual finding is deemed clearly erroneous when "although there is evidence to support it, the reviewing court on the entire evidence is left with the definite and firm conviction that a mistake has been committed." *United States v. United States Gypsum Co.*, 333 U.S.

364, 395, 68 S.Ct. 525, 92 L.Ed. 746, 76 USPQ 430, 443 (1948).

The district court, reviewing the evidence, found that the engineering consensus before appearance of the '787 invention was that lost foam processes having all stations on-line can not be operated as a continuously linked system. The metal casting systems cited by Fata to support its contention of obviousness were "accumulating" systems that did not operate continuously, or on-line green sand metal casting systems; no reference showed or suggested how to modify these systems for continuous lost foam casting.

The district court found that there was no teaching, suggestion, or reason in the prior art to select aspects of the prior art and combine them in the manner of the '787 system. *See Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1385, 58 USPQ2d 1286, 1293 (Fed. Cir.2001) ("In holding an invention obvious in view of a combination of references, there must be some suggestion, motivation, or teaching in the prior art that would have led a person of ordinary skill in the art to select the references and combine them in the way that would produce the claimed invention."); *C.R. Bard, Inc. v. M3 Sys., Inc.*, 157 F.3d 1340, 1352, 48 USPQ2d 1225, 1232 (Fed.Cir.1998) (a showing of a suggestion, teaching, or motivation to combine the prior art references is an "essential evidentiary component of an obviousness holding").

Fata states that the district court erroneously ruled that the turntable system at General Motors' Rochester Products facility was not prior art to the Vulcan system. The Rochester Products system was intended to be a continuous on-line lost foam casting system, wherein a large turntable carried flasks to three operating stations by indexed movement. It was designed by an employee at the Rochester Products facility, built by a company hired for the purpose, and dismantled as inoperable soon after it was built. The court found that the Rochester

Products system was "secret" and that it was not on sale or publicly known or used, and correctly held that it was not prior art. *See* 35 U.S.C. § 102 (stating the statutory sources of prior art). However, exercising prudence, the district court considered the effect that the Rochester Products system would have had on the validity of the '787 patent if it were deemed to be prior art. The court found that the Rochester Products system did not have pivotally-mounted gondolas and did not have a track, and that "nothing in Rochester Products suggests or teaches the invention claimed in the '787 patent or in combination with other cited art."

The district court gave weight to the commercial success of the Vulcan '787 system. *See Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387,1391, 7 USPQ2d 1222, 1225 (Fed.Cir.1988) ("The commercial response to an invention is significant to determinations of obviousness, and is entitled to fair weight.") The record shows contemporaneous recognition of the achievements of the Vulcan system, including articles in trade journals and testimony of witnesses concerning the belief in the engineering community that the lost foam process could not be effectively mechanized as a continuous on-line process. Appreciation by contemporaries skilled in the field of the invention is a useful indicator of whether the invention would have been obvious to such persons at the time it was made. *See Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538, 218 USPQ 871, 879 (Fed.Cir.1983) ("evidence of secondary considerations may often be the most probative and cogent evidence in the record").

Other Grounds

The district court also rejected Fata's claim that the '787 patent is invalid for anticipation, observing that Fata had introduced no single piece of prior art showing, or purporting to show, all elements of the claims. *See Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236,

9 USPQ2d 1913, 1920 (Fed.Cir.1989) (an anticipating reference must describe all claimed aspects of the invention). The court also rejected Fata's claim that the '787 patent is invalid for lack of enablement. These rulings have not been appealed. The district court commented on Fata's scatter-shot arguments for invalidity with the observation that this case is "too important . . . for throw-away and truncated arguments."

We do not discern reversible error in the district court's findings and conclusions, and affirm the ruling that the patent is not invalid.

II

INFRINGEMENT

Analysis of patent infringement proceeds in two stages. First, if there is a dispute as to the scope or meaning of a claim or any aspect thereof, the court will resolve the issue as a matter of law. Second, it is determined whether the accused product or system is within the scope of the claim, a question of fact. *See Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 46 USPQ2d 1169 (Fed.Cir.1998) (*en banc*).

Claim 1, *supra*, includes several limitations in functional terms, stated in the "means" form authorized by 35 U.S.C. § 112 ¶ 6. The scope of three "means" terms was at issue: (1) the "closed curvilinear track means," (2) the "means for registering said flask thereon [on the gondola] for alignment," and (3) the "drive means for effecting intermittent movement of the mold carriers between indexed positions along said track means." Fata conceded that these claimed functions were performed in its system, but argued that the corresponding structures were not equivalent. The district court, comparing the structures described in the '787 patent with the structures of the Fata system, found structural identity or structural equivalence as to all three functional elements.

Functional terms written in "means" form are "construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof." 35 U.S.C. § 112 ¶ 6. Infringement is found literally if the claimed function is performed by either the structure described in the patent or an equivalent of that structure. *Texas Instruments Inc. v. United States Int'l Trade Comm'n*, 805 F.2d 1558, 1562, 231 USPQ 833, 834-35 (Fed.Cir.1986). Thus construction of "means" claim terms requires review of not only the function, but also the structure by which it is performed. *Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus., Inc.*, 145 F.3d 1303, 1308, 46 USPQ2d 1752, 1756 (Fed. Cir.1998) ("a determination of corresponding structure is a determination of the meaning of the 'means' term in the claim and is thus also a matter of claim construction").

1.

The district court found that the "closed curvilinear track means" provides a closed loop on which the gondolas ride through the operating stations, and that the corresponding structure in the '787 patent is a closed curvilinear pair of rails. Fata's system has a closed loop curvilinear pair of rails on which the gondolas ride. The Fata system also has an inner track to prevent lateral movement of the gondolas. The district court found that the presence of an additional track, having a different purpose and function, does not negate the presence of an identical track for the identical purpose. Fata does not appeal the court's findings with respect to this element.

2.

The "means for registering said flask thereon for alignment" fits the flask to the gondola, thereby bringing the flask into alignment with the compaction station. The district court found that the corresponding structure described in the '787 specification is a recep-

tacle on the gondola and two posts on the flask, wherein the posts fit into the receptacle. Fata's system also has a receptacle and two posts that fit into the receptacle and thereby align the gondola with the compaction station; however, Fata places the receptacle on the flask and the two posts on the gondola. The district court found that these differences are insubstantial, and that the structures are equivalent.

Fata argues that the district court erred in finding these differences to be insubstantial. Fata states that the registration means in the '787 patent consists of an alignment plate on the gondola with cutout holes, whereas in the Fata system there are simply circular holes on the flask. Vulcan presented expert testimony that it does not matter, from a mechanical or engineering standpoint, whether the posts and receptacles are located on the gondola or on the flask, and that anyone of ordinary skill would know to interchange the posts and the receptacles for the posts, to perform the same function of alignment. Known interchangeability is an important factor in determining equivalence. *See Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 36, 117 S.Ct. 1040, 137 L.Ed.2d 146, 41 USPQ2d 1865, 1874 (1997). The district court's finding that these structures are equivalent is not clearly erroneous, and is affirmed.

Fata also argues that the district court erred in its construction of the "registration" means because the court did not attribute two functions to the means shown in the patent. Fata states that the '787 registration means serves the dual functions of registering or locating the flask on the gondola and aligning the posts of the flask with the compactor pedestals through which vibration for compaction is transferred. Fata states that in its system both of these functions are not performed by its receptacle and post structure, and that infringement is thereby avoided. Fata does not dispute that the registration function is identically performed in its sys-

tem. Vulcan responds that the '787 registration means is claimed for the function of aligning the flask on the gondola, and that any additional benefit does not diminish the claimed function.

It is irrelevant whether an element has capabilities in addition to that stated in the claim. When the claimed function is performed in the accused system, by the same or equivalent structure, infringement of that claim element is established. See Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 945, 15 USPQ2d 1321, 1332 (Fed.Cir.1990) (infringement is not avoided "if a claimed feature performs not only as shown in the patent, but also performs an additional function"). The district court correctly construed the registration means.

Fata also argues that Vulcan redefined its invention for litigation purposes in a manner that conflicts with the patent's prosecution history, pointing to Vulcan's amendment to claim 14 where the text was changed from "each gondola supporting one of said flask in proper cooperative alignment with said operating stations" to "each gondola including means for registering one of said flask in proper cooperative alignment with said operating stations." The reason for the amendment is not clear on the prosecution record. However, it has not been shown that this amendment altered the meaning of claim 14, or changed the meaning of claim 1. The district court's interpretation of claim 1 is consistent with the examiner's interpretation on reexamination that: "The inclusion of means for registering in each gondola for alignment [of] each flask in the compacting (or mold forming) station limits the claimed system to a non-accumulating, on-line casting system." We do not discern any conflict between the district court's view of the '787 invention and the prosecution history.

3.

Third, Fata contends that the district court erred in its application of the "drive means" to Fata's drive sys-

tem. Claim 1 describes the drive means as serving the function of "effecting intermittent movement of the mold carriers between indexed positions along said track means."

The district court made a detailed comparison and analysis of the corresponding structures. The court found that both the '787 system and the Fata system have a drive means that includes a hydraulically driven carriage, called a Geneva movement. The '787 specification shows the drive means as including a latch and stop gripper to engage the gondola, while Fata uses front and back levers to grip and engage the gondola. In addition, the '787 drive shows, and Fata uses, a plurality of limit switches and a programmable controller in the drive means. The court found that the structures shown in the '787 patent and those of the Fata system were the same or equivalent, in that the only difference was Fata's use of a gripper with front and back levers instead of a latch and stop. Fata disputes the conclusion that this difference is insubstantial. At the trial witnesses testified that the two levers combine the basic features of a latch and stop, are interchangeable, and operate in the same way. The district court's finding that this is not a substantial difference is not clearly erroneous, and is affirmed.

Fata states that its drive system has features in addition to those shown in the '787 patent, pointing out that in addition to a shock absorbing stop as shown in the '787 patent, Fata uses an electronic valve that slows the carriage to a controlled stop. Also, Fata states that its gripper permits reversal of the direction of the gondolas, and that Fata also includes another gripper that serves to stabilize the gondolas. The district court correctly pointed out that when all of the claimed features are present in the accused system, the use of additional features does not avoid infringement. *See Northern Telecom*, 908 F.2d at 945, 15 USPQ2d at 1332 ("The addition of features does not avoid infringement, if all

the elements of the patent claims have been adopted."); *Texas Instruments*, 805 F.2d at 1568, 231 USPQ at 839 ("As a matter of law, subsequent improvements do not in themselves preclude a finding of infringement.")

4.

Fata also argues that the district court attributed excessive scope to the claims, and points to the following statement in the court's opinion as showing this error: "The infringement analysis is based on the scope of the claim-in-issue as a measure of the invention and is not confined to the particular mode of use or preferred embodiment described in the specification." We discern no error in the district court's statement of the law. This court has often explained that the claims are construed in light of the specification, and are not limited to a designated "preferred embodiment" unless that embodiment is in fact the entire invention presented by the patentee. *See Texas Instruments*, 805 F.2d at 1563, 231 USPQ at 835 ("This court has cautioned against limiting the claimed invention to preferred embodiments or specific examples in the specification.") When the claims include means-plus-function terms in accordance with § 112 ¶ 6, claim scope necessarily is not limited to the preferred embodiments, but includes equivalents thereof. The district court correctly stated, and applied, the law of claim construction.

Conclusion

The district court's claim construction is confirmed. On this construction the court's finding of infringement is not clearly erroneous, as has been discussed in connection with the claim construction, and is affirmed.

III

DAMAGES

The district court's determination of the amount of damages is a question of fact that is reviewed for clear

error, while the method used by a district court in reaching that determination is reviewed for an abuse of discretion. *Cybor*, 138 F.3d at 1461, 46 USPQ2d at 1179. The patentee bears the burden of proving its damages by a preponderance of the evidence. *See Hebert v. Lisle Corp.*, 99 F.3d 1109, 1119, 40 USPQ2d 1611, 1618 (Fed. Cir.1996).

The district court announced from the bench on May 21, 1999, that it had decided liability in favor of Vulcan. On July 28, 1999, before the damages phase, Vulcan and General Motors entered into an agreement in which Vulcan promised not to sue General Motors for its "prior, present and future use, sale, and offer to sell or other disposition" of line 1, which had been completed by Fata and installed at General Motors' Saginaw plant in November 1998. The agreement also granted General Motors a "limited license to have made by FATA, use, sell and offer to sell or otherwise dispose of the four remaining casting lines to be supplied for the Saginaw facility by FATA." The agreement provided that the "license to GM specifically authorizes FATA to supply to and install these four remaining casting lines at the GM Saginaw facility." Paragraph 4 of the Agreement further provided as follows:

> 4. This Agreement does not waive, release, compromise or discharge any claim that Vulcan may have against Fata with respect to the first casting line delivered by Fata to the GM Saginaw, Michigan facility or any claim Vulcan may have against Fata for Vulcan failing to obtain the business of supplying the five casting lines for the GM Saginaw facility.

In the district court Vulcan sought damages from Fata for lines 1 through 5, stating that ¶ 4 preserved Vulcan's right to full damages for infringement. The district court awarded Vulcan its lost profits for line 1, and held that no damages had been proven as to lines 2 through 5.

Line 1 Damages

For line 1, Fata does not appeal the award of lost profits as measured by the district court. Vulcan states that the accounting of lost profits should have taken account of the price erosion whereby Vulcan was obliged to lower its bid in view of Fata's infringing bid. The district court calculated Vulcan's lost profits from Vulcan's reduced bid, explaining that Vulcan did not know that Fata had offered an infringing system at the time that Vulcan presented its bid.

For price erosion damages the patentee must show that, but for the infringement, it would have been able to charge and receive a higher price. *See Lam, Inc. v. Johns-Manville Corp.*, 718 F.2d 1056, 1065, 219 USPQ 670, 675 (Fed.Cir.1983). It is not required that the patentee knew that the competing system infringed the patent, if the patentee reduced its price to meet the infringer's competition. *Brooktree Corp. v. Advanced Micro Devices, Inc.*, 977 F.2d 1555, 1580, 24 USPQ2d 1401, 1419 (Fed.Cir.1992) (price erosion losses, when reasonably related to the infringing activity, may accrue before the infringement has been verified or proved in court). *See generally Kalman v. Berlyn Corp.*, 914 F.2d 1473, 1485, 16 USPQ2d 1093, 1102 (Fed.Cir.1990); *Lam*, 718 F.2d at 1067, 219 USPQ at 676. Thus price erosion damages do not require that Vulcan knew, at the time of its bid, that Fata's competing bid was for an infringing system. However, Vulcan must establish the amount of price reduction, and that the price was reduced in response to the competing bid. The district court made no findings on these aspects.[2] We remand

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[2] The dissent, while agreeing that it would be impermissible for the district court to have required Vulcan to show that it knew Fata offered an infringing system to establish price erosion damages, contests whether the district court made findings that would preclude the award of such damages on remand. The district court found that "There is no evidence in the record to support Stewart's assumption that Vulcan computed its bid in response to Fata's . . . bid for an infringing system," holding that such evidence is necessary to support a claim for price erosion. There

for determination of whether Vulcan established facts supporting its position that but for the infringement it would have obtained a higher price, and if so, the re-assessment of damages for line 1.

Lines 2 through 5

The district court held that Vulcan's license agreement with General Motors bars Vulcan from obtaining damages based on lost profits or a royalty arising from Fata's sale of lines 2 through 5. The court held that Vulcan's reserved right to damages for "failing to obtain the business" led to no award because such damages had not been proved with sufficient certainty. Thus although the court found that Fata's bids for lines 2 through 5 constituted infringing offers of sale during the period before Vulcan's license to General Motors, no damages were proven. Vulcan argues that damages for lines 2 through 5 should be determined in the same way as for line 1; that is, Vulcan's lost profits on these infringing sales.

The district court ruled that Vulcan, by paragraph 4 of its license agreement with General Motors, had reserved a right to damages only for "failing to obtain the business of supplying" lines 2 through 5. The court declined to view this reservation as entitling Vulcan to full

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was however evidence that Vulcan computed its bid in response to Fata's competition. For example, Bruce McMellon, president of Vulcan, testified:

> Between March and July 1997 Vulcan learned that Fata was a serious competitor for the lost foam casting lines. Because of this competition, Vulcan lowered its markup for the July 1997 rebid to General Motors below the markup included in the March 1997 bid and below the level which would have allowed Vulcan to realize the profit margin in the Massena bids which GM had accepted. . . . Without the competition from Fata, Vulcan would not have lowered its price to General Motors below a price which would have allowed Vulcan to realize the accepted Massena bid profit margin.

The fact of price erosion does not depend on whether Vulcan knew, at the time, that the Fata system was infringing.

damages from Fata, Vulcan having licensed General Motors "to have made by FATA, use, sell, and offer to sell" the remaining lines to be supplied by Fata. The court held that "failing to obtain the business" related only to Fata's offer of sale, but not its actual sale, which the district court apparently deemed licensed through the General Motors' agreement. Thus the district court held that Vulcan was required to prove its damages for "failing to obtain the business," held that Vulcan "had not proven the amount with any degree of certainty," and awarded none.

We conclude that Vulcan was not entitled to damages for lines 2 through 5 in view of its license to General Motors. Vulcan's grant of an express license "to have [lines 2-5] made by FATA" is not consistent with the assertion of damages against Fata for infringement by lines 2 through 5. *Cf. Cyrix Corp. v. Intel Corp.*, 77 F.3d 1381, 1387-88, 37 USPQ2d 1884, 1888-90 (Fed.Cir.1996) (finding no infringement when licensee acted within scope of its "have made" rights). On this ground, we affirm the district court's decision to award no damages for lines 2 through 5.

Enhanced Damages

Vulcan appeals the district court's finding that Fata's infringement was not "willful" and thus not subject to enhancement of the damages award. Willfulness is a question of fact, and is reviewed under the clearly erroneous standard. *See Rite-Hite Corp. v. Kelley Co., Inc.*, 819 F.2d 1120, 1126, 2 USPQ2d 1915, 1919 (Fed.Cir. 1987).

The rules of patent infringement are rules of business ethics, and require prudent commercial actions in accordance with law. *See SRI Int'l, Inc. v. Advanced Tech. Labs., Inc.*, 127 F.3d 1462, 1465, 44 USPQ2d 1422, 1424 (Fed.Cir.1997). 35 U.S.C. § 284 provides remedy to the patentee when these standards are not met, up to three times the amount of found or assessed damages.

The tort of willful infringement arises upon deliberate disregard for the property rights of the patentee. Thus the focus is generally on whether the infringer exercised due care to avoid infringement, usually by seeking the advice of competent and objective counsel, and receiving exculpatory advice. When it is found that the infringer acted without a reasonable belief that its actions would avoid infringement, the patentee has established willful infringement, which may be accompanied by enhanced damages. *See Crystal Semiconductor Corp. v. TriTech Microelectronics Int'l, Inc.*, 246 F.3d 1336, 1346, 57 USPQ2d 1953, 1957 (Fed.Cir.2001). Such entitlement is not absolute, however, and reasonable discretion reposes in the district court, on consideration of all of the circumstances. *See SRI*, 127 F.3d at 1468-69, 44 USPQ2d at 1427.

The district court found that Fata met its duty to exercise due care by seeking legal advice from a reputable law firm in the United States after receiving notice of possible infringement by way of General Motors on or about August 13, 1997. The court found that Fata relied in good faith on the attorney's advice that the '787 patent was either invalid or did not cover the system proposed by Fata, based on written opinions received on September 12, 1997 and December 18, 1997. Vulcan argues that Fata had already submitted its infringing offer to General Motors before it sought the advice of United States counsel, and that evidence at trial showed that Fata had knowledge of the '787 patent as early as 1993, and that there was a communication between company executives before Fata submitted its bid. Thus Vulcan argues that Fata knew that a lost foam casting system meeting the General Motors specifications would or could reasonably infringe Vulcan's patent, and that Fata took no steps to obtain the advice of counsel until it was notified of infringement.

Although we view the question as close, Vulcan has not shown clear error in the district court's finding that

Fata's infringement was not willful, or that the court abused its discretion in declining to enhance damages. Although Fata did not show that it obtained legal advice before submitting its bid, it acted promptly upon receiving notice of infringement, at a time when its bid had been accepted but no other infringing activity was shown. We note the thoroughness with which the district court explored the issue, and on this close question give deferential weight to that court's evaluation of the evidence.

The district court also rejected Vulcan's assertion that this was an exceptional case, and denied the requested attorney fees. We do not intrude upon the district court's exercise of discretion on this issue.

IV

THE REQUESTED NEW TRIAL

Fata moved for a new trial pursuant to Fed.R.Civ.P. 59, stating that it wished to introduce additional prior art with respect to patent validity. A district court's denial of a new trial based on assertedly newly discovered evidence is reviewed for abuse of discretion. *See Good v. Ohio Edison Co.*, 149 F.3d 413, 423 (6th Cir.1998). We apply Sixth Circuit law to this procedural aspect, taking note that this standard appears to be common to all circuits. *See generally National Presto Indus., Inc. v. West Bend Co.*, 76 F.3d 1185, 1188, 37 USPQ2d 1685, 1686 (Fed.Cir.1996) (applying regional circuit law to procedural matters that are not unique to patent cases).

Fata filed this motion seven months after the liability trial had closed and two months after the court's announcement of its decision on validity. Final judgment had not been entered, for the damages phase had not been completed. Fata argues that it satisfied the requirements of Rule 59(b), which states that a motion for a new trial "shall be filed no later than 10 days after entry of the judgment." However, whether or not Fata's motion was untimely under Rule 59, the district court

did not abuse its discretion in declining to grant a new trial.

Fata's motion cited several patents on a green sand casting system, all of which were issued before 1975. Fata states that it did not offer this evidence during the trial because it could not foresee how the court would interpret the patent. Fata does not explain how this purported uncertainty lulled it into avoiding this body of references. A party must present its evidence at the trial, absent some extraordinary development or unwarranted surprise, by a party or the court, whereby justice requires redoing the trial. The green sand casting system was before the court and the parties during the trial, and the now-offered patents were readily available public information. The district court's ruling that Fata had not presented justification for their belated presentation is well supported. The denial of a new trial is affirmed.

SUMMARY

We affirm the district court's ruling that the '787 patent is valid and infringed. We affirm the district court's award of lost profits for line 1, modified in that Vulcan may attempt to establish, on remand, entitlement to additional price erosion damages for line 1. The district court's denial of damages for lines 2 through 5 is affirmed, as is the denial of attorney fees, enhanced damages, and a new trial.

Each party shall bear its costs.

AFFIRMED; DAMAGES MODIFIED; REMANDED.

MICHEL, Circuit Judge, dissenting in part.

I respectfully dissent from two of our damages rulings today.

I.

First, contrary to the majority's opinion, the district court most assuredly made factual findings concerning price erosion:

> [Vulcan's expert witness] Stewart assumed that had [the accused infringer] Fata not bid, Vulcan could have obtained the General Motors business at a higher price and therefore should be compensated for the erosion of its prices caused by Fata's infringement. *There is no evidence in the record to support Stewart's [i.e., Vulcan's] assumption that Vulcan computed its bid in response to Fata.* Vulcan did not know Fata was bidding an infringing system. * * * Vulcan lost the bid to Fata because its bid was almost a third higher. *There is no credible evidence to support Vulcan's assertion that its bid price to General Motors was shaped to respond to a bid for an infringing system. There is no credible evidence to support a claim for price erosion.*

(J.A. 58.24-58.25) (emphasis added). In other words, the district court found that Vulcan had failed to satisfy its burden of showing that, indeed, Vulcan had "computed [or shaped] its bid in response to Fata."

I agree that portions of the above-quoted language could suggest that the district court may have inadvertently (and impermissibly) required Vulcan to also show that it knew Fata was bidding with an infringing system, though that does not seem immediately clear to me either. Regardless, even assuming the district court did require this showing, that requirement would amount to nothing more than harmless error, *see* Fed.R.Civ.P. 61, given again that no "credible evidence" shows that Vulcan had in any event shaped its bid to GM in response to Fata's competing bid. In my view, then, it would seem

a waste of judicial resources, not to mention client fees, to remand this particular issue to the district court so the court, again, could simply reiterate what it had said before; that no "credible evidence" supports a claim that Vulcan had shaped its bid in response to Fata's.

The majority cites to testimony from Vulcan's president, Bruce McMellon, suggesting that this testimony further justifies its decision to remand on this price-erosion point. But again, the district court assumedly rejected this evidence as "incredible," a fair assumption given that the testimony came from a witness as putatively biased as the president of Plaintiff Vulcan itself. Moreover, Vulcan itself does not decry the district court's findings in this regard as insufficient or "clearly erroneous," *see* Fed.R.Civ.P. 52(a), the high standard it would have to meet in order to obtain a reversal on a factual determination. And yet, the majority appears to do just that, noting that some evidence, *e.g.*, McMellon's testimony, supports Vulcan's price-erosion claim and, at the same time, narrowly reading the district court's opinion so that it squarely "hold[s]" that Vulcan had to know that the system Fata was offering was an infringing system. I do not read the district court's opinion so narrowly, and would not substitute my view of the evidence for the facts found by the district court, especially since Vulcan itself does not challenge these factual findings as clearly erroneous.

II.

Second, however, I do believe the district court and the majority have erred by determining that the license agreement between Vulcan and GM – a nonparty – precluded Vulcan from recovering damages from Fata for infringing lines 2-5. As I understand it, the district court's decision in this regard actually rested on two reasons: first, that allowing Vulcan to benefit from both the license agreement it had with GM and from the damages that Vulcan tried to recover for these

infringing lines would constitute a double recovery or "windfall"; and second, that damages for infringing "offers to sell" under 35 U.S.C. § 271 and damages for actual sales "qualitatively" differ, meaning the evidence needed to prove an entitlement to each must also differ. Vulcan, reasoned the district court, had simply and mistakenly relied on the same type of evidence to prove damages for the infringing "offers to sell" as it had to prove damages for the completed infringing sale.

Both of these asserted rationales have facial appeal. But on closer scrutiny, neither holds up as applied to the facts of this case. First, the license agreement neither absolves Fata of damages for infringing lines 2-5 nor gave Vulcan a "windfall." It bears emphasizing that the language of the agreement took pains to make clear that Vulcan and the only other party to the agreement (GM) did not in any way intend to foreclose Vulcan's right to recover damages against Fata:

> This [Vulcan-GM] Agreement *does not waive, release, compromise or discharge any claim that Vulcan may have against Fata with respect to* the first casting line delivered by Fata to the GM Saginaw, Michigan facility or *any claim Vulcan may have against Fata for Vulcan failing to obtain the business of supplying the five casting lines for the GM Saginaw facility*.

(J.A. 58.15) (emphasis added). By any reasonable interpretation, the language above does not in any way limit the damages that Vulcan could receive for "failing to obtain the business," *i.e.*, the lost sales for supplying casting lines 2-5. Remember, too, that GM and Vulcan had signed this license after the liability phase of the trial but before the damages phase of the trial had begun. So one would hardly expect Vulcan to agree to a contract that would in turn forego its rights to receive the full amount of damages that otherwise seemed destined to come its way. After all, the district court indicated in May 1999, *i.e.*, before GM and Vulcan signed

this license agreement, that it had already found Fata liable for infringing all nine casting lines.

Further, nothing in the license contract suggests that any party besides GM and Vulcan had rights under it. Thus, we can hardly say that Vulcan had licensed or "permitted" Fata to do anything without incurring damages for it; to the contrary, the license merely gave *GM* the right to timely *receive* these four infringing lines without having Vulcan stand in the way, *e.g.*, by seeking an injunction enjoining Fata's delivery of these lines. And neither party suggests that Fata somehow qualified as a third-party beneficiary to this license agreement, notwithstanding the clear language used to preserve Vulcan's right to recover damages against Fata.

The district court's reasoning about Vulcan receiving a "windfall" also does not persuade me. Again, the license agreement was between GM and Vulcan, not Vulcan and Fata. And GM and Vulcan each received valuable consideration under their bargain, thereby making their agreement a binding one. For its part, GM received the right to have Fata provide the four infringing systems that Fata had already finished manufacturing without Vulcan exercising its right to thwart Fata's delivery. In other words, GM received assurances that Vulcan would not deter the *timely* delivery of the systems that Fata was ready to produce by seeking, *e.g.*, an injunction that would prohibit this delivery. (As Vulcan's counsel indicated at oral argument, Vulcan did not have any ready-made casting lines that it could immediately deliver in Fata's stead, at least not for the infringing lines 2-5.)

In exchange, GM gave Vulcan the right to some of the "business" it had otherwise lost – the business of providing the other lines (lines 6-9) that Fata had not yet made (and that GM, presumably, did not immediately need), along with opportunities to bid on other GM contracts. This consideration does not amount to a "windfall"; it simply constitutes the consideration that GM gave in

exchange for Vulcan forfeiting its right to seek relief that would enjoin the delivery of lines 2-5. Vulcan never received any damages (or any other remedy, for that matter) for the four acts of infringement relating to lines 2- 5. Put differently, Vulcan received nothing to make it "whole" for profits lost to Fata as a result of the four infringing devices that GM accepted, contrary to the very purpose of awarding damages in the first place.

Last, the district court should have considered the evidence that Vulcan used to prove damages for the four infringing "offers to sell," even though Vulcan presented the same type of evidence for these "offers to sell" as it did for the completed sale of an infringing line. In this case, GM could have lawfully offered the Saginaw agreement (including lines 2-5) to Vulcan only. This is so because GM's contract specifications set forth the exact requirements that Vulcan's '787 patent already covered. In addition, GM approached only two companies about providing the nine casting lines that it needed for its Saginaw foundry – Vulcan and Fata. And only two companies thereafter sought this business with GM – Vulcan and Fata. So unless GM suddenly changed its contract specifications and opened up the bidding to other companies or unless Vulcan simply decided not to enforce its patent rights at all, no one besides Vulcan – one of only two parties approached by GM – could have supplied all the requested casting lines. (The record, by the way, does not bear out any of these hypothetical situations.)

In these circumstances, then, Vulcan correctly asserts that a "but for" test should determine the damages it can recover for an infringing offer for sale, given again that only two suppliers (Vulcan and Fata) competed in the relevant market:

> The question to be asked [is] primarily: had the Infringer not infringed, what would Patent Holder * * * have made? *In determining such damages, the profits lost by the patent owner in a two-supplier*

> *market is a proper ground for granting relief. Lost profits may be in the form of diverted sales,* eroded prices, or increased expenses. The patent holder must establish a causation between his lost profits and the infringement. *A factual basis for the causation is that 'but for' the infringement, the patent owner would have made the sales that the infringer made,* charged higher prices, or incurred lower expenses.

Lam, Inc. v. Johns-Manville Corp., 718 F.2d 1056, 1064-65 (Fed.Cir.1983) (quoting *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 377 U.S. 476, 507, 84 S.Ct. 1526, 12 L.Ed.2d 457 (1964)) (citations omitted) (emphasis added). Applying the "but for" test, therefore, Vulcan would indeed have obtained the GM business: "But for" Fata's four infringing offers, Vulcan – the only party whose patented casting line "read on" to GM's contract specifications – would have received these four contracts to build casting lines 2-5. Accordingly, the "offer-to-sell" damages (and the type of evidence needed to show them) here are indeed the same as the damages (and the type of evidence needed to show them) that Vulcan would have received for any other infringing sale, *i.e.*, lost profits resulting from these four lost sales. Again, however, Vulcan received nothing for the loss of these four contracts, in derogation of the principle that damages should make aggrieved parties whole. The benefits that Vulcan received in its license agreement with GM merely constituted the consideration that Vulcan received for giving away its right to obtain another remedy; namely, an injunction against Fata's imminent and infringing delivery of lines 2-5.

Nevertheless, the district court failed to more closely construe the plain language of the GM-Vulcan license, and it failed to consider that this agreement gave rights to GM only. In addition, the court failed to apply the "but for" test for a two-supplier market. Accordingly, I would vacate and remand this portion of the court's

judgment for additional findings about the damages owed to Vulcan for the four infringing offers to sell. The district court could have calculated these damages by examining the same type of evidence that Vulcan had presented for any other completed-but-infringing sale.

III.

For the reasons stated above, I would affirm the express findings made by the district court about no price erosion. But I would vacate and remand the court's determination about the damages for the infringing offers to sell lines 2-5. I therefore respectfully dissent, in part, from the majority's decision.

APPENDIX B

UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION

No. 98-74495

VULCAN ENGINEERING CO., INC.,
Plaintiff,

v.

FATA ALUMINIUM, INC., AND FATA GROUP, S.P.A.,
Defendants.

[Aug. 10, 1999]

AMENDED OPINION[1]

[List of Counsel and Table of Contents omitted]

I. INTRODUCTION

A. Nature of the Dispute

This is a patent case involving a claim of infringement and a counterclaim of invalidity. Also involved are ancillary claims of false representations and unfair competition by plaintiff.

The patent in suit, United States Patent No. 4,736,787 (the '787 patent) (Px1), issued on April 12, 1988, to Bruce McMellon (McMellon) based on an application dated June 29, 1987. The '787 patent is assigned to plaintiff Vulcan Engineering Co. (Vulcan) and covers a lost foam handling system, which is better described as

[1] This Amended Opinion is a revision and enlargement of the Court's bench opinion of May 21, 1999, and it incorporates the corrections set forth in the Errata filed August 10, 1999.

an interconnected, continuously-linked lost foam casting system.

Vulcan claims that defendants FATA Aluminium, Inc., a Delaware corporation with offices in Michigan, and FATA Group, S.p.A., an Italian corporation, headquartered in Turin, Italy (collectively FATA), have infringed the '787 patent in the offering, manufacture, and sale of a lost foam casting system to General Motors Corporation (General Motors) for its Saginaw, Michigan foundry (Saginaw). 35 U.S.C. § 271. Vulcan also claims that FATA's assertions in commercial promotions and advertisements that it designed and engineered the system it sold to Saginaw are false, have hurt Vulcan's reputation, and have created confusion in the marketplace. 15 U.S.C. § 1125(a), Lanham Act, § 43(a).

FATA denies infringement and claims that the '787 patent is invalid and unenforceable because of anticipation and obviousness, because its disclosure is non-enabling, and because it omits two indispensable objects of the invention. 35 U.S.C. §§ 102, 103,112. FATA also claims Vulcan is guilty of "unclean" hands and states it will assert such a defense should Vulcan prevail in its infringement claim and seek an injunction.

B. The Claim-In-Issue

By agreement of the parties, Vulcan's claim of infringement is limited to Claim 1 of the '787 patent, and FATA's counterclaim of invalidity is also so limited. Claim 1 reads:

1. In a lost foam casting system,
    2. a closed curvilinear track means having
        3. a loading and compaction station,
        4. a metal pouring station, and
        5. a mold unloading system;
    6. a plurality of flask carrying gondolas

7. supported for movement along the track means

8. with each gondola including means for registering said flask thereon for alignment in said compaction station, and

9. with each of said gondolas being pivotally connected to each adjacent gondola;

10. drive means for effecting intermittent movement of the mold carriers between indexed positions along said track means;

11. a plurality of mold forming flasks

11a. adapted for registry in said gondolas, and

11b. detachably supported thereon.

C. Trial/Post Trial

The case was tried to the Court over seven days in March 1999. Following trial, the parties filed proposed findings of fact and conclusions of law, as well as post-trial briefs. These filings were followed by oral argument.

FATA has filed a post-trial paper styled "Defendants' Statement of Objections to Claim Construction Findings." Because the objections are merely a belated effort to gain reconsideration of the *Corrected Order on Claim Construction* filed March 3, 1999 (attached as Exhibit A), the *Memorandum on Claim Construction* filed March 4, 1999 (attached as Exhibit B), and the *Order of Corresponding Structures* entered March 10, 1999 (attached as Exhibit C), as well as a contradiction of FATA's representations to the Court as to its defenses to the claim of infringement at the final pretrial conference on March 4, 1999 (Tr. 3/4/99, pp. 22-23, 37-38), no consideration

will be given to the paper. *See* E.D. Mich. L.R. 7.1(g)(3).[1] Claim construction is not a work in progress. Claim construction should be reconsidered if subsequent proceedings or the trial record reveals aspects not apparent at the time of the initial decision. This has not happened here.

FATA has also filed a paper styled "FATA's Motion For Judgment as a Matter of Law on Count II – Unfair Competition/False Advertising." This Opinion does not cover Vulcan's claims of false representations and unfair competition or FATA's defenses. Consideration will be given to these matters at a later date.

D. Decision

For the reasons that follow, which constitute the findings of fact and conclusions of law required by Fed. R. Civ. P. 52, the Court finds for Vulcan. FATA did not overcome the presumption of validity that attaches to an issued patent by establishing with clear and convincing evidence that the '787 patent is invalid. *See* 35 U.S.C. § 282; *Applied Materials, Inc. v. Advanced Semiconductor Materials America, Inc.*, 98 F.3d 1563, 1569-70 (Fed. Cir. 1996), *cert. denied*, 520 U.S. 1230 (1997). FATA did not introduce evidence of prior art containing the limitations of Claim 1 of the '787 patent. McMellon's invention was not obvious, and the specification is sufficient to teach one skilled in the art how to make and use the claimed invention. Likewise, the disclosure did not omit any indispensable elements of the claimed invention.

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[1] Under E.D. Mich. L.R. 7.1(g)(3):

> Generally, and without restricting the court's discretion, the court will not grant motions for rehearing or reconsideration that merely present the same issues ruled upon by the court, either expressly or by reasonable implication. The movant must not only demonstrate a palpable defect by which the court and parties have been misled but also show that correcting the defect will result in a different disposition of the case.

Further, Vulcan established by a preponderance of the evidence that the lost foam casting system that FATA sold to Saginaw infringes the '787 patent. Vulcan satisfied its burden to establish that the limitations of Claim 1 of the '787 patent, properly construed as to scope and meaning, are found in the lost foam casting system FATA sold to Saginaw. Because the issue at trial with regard to infringement was the structure of the three means-plus-function limitations of Claim 1, Vulcan satisfied the Court that either the structures disclosed in the specification or their equivalents were incorporated in the lost foam casting system FATA sold Saginaw. In other words, "the differences between the structure in the accused device and any disclosed in the specification are insubstantial." *Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus., Inc.*, 145 F.3d 1303, 1309 (Fed. Cir. 1998).

II. BACKGROUND

A. Casting

1. Traditional Casting Art

Casting, or forming articles from molten metals using molds, is an old art form. In general, a casting operation involves three steps, or stations: a compaction station (mold making station), a pouring station, and a dumping station. At the compaction station, sand is bonded together, or "compacted," around a pattern to form a mold. The pattern is then removed. At the pouring station, molten metal is poured into the mold. After the metal cools to form a casted article, the casted article is removed, or "dumped" in casting parlance, at the dumping station.

"Green sand" casting is the popular name given to a traditional method of casting. In green sand casting, sand bonded with clay and water is placed into a rigid permanent pattern. The bonded sand is then compressed against the pattern to form a cavity in the shape of the pattern. This compaction forces the bonded sand

to stick together. Because the pattern must be removed, the mold must be made in two halves: the "cope" is the top half, and the "drag" is the bottom half. After the pattern is removed, the cope and drag are joined together to form the completed mold.

2. Lost Foam Casting

Lost foam casting was invented in 1958 by H.F. Shroyer, United States Patent No. 2,830,343 (Dx 172). In lost foam casting, a polystyrene pattern is compactly buried in a container, or flask, filled initially with unbonded sand. Unlike green sand casting, however, the polystyrene pattern is not removed at the compaction station. Rather, the sand is compacted around the pattern to form the mold. Shroyer's invention calls for the molten metal to burn out the pattern, hence the term lost foam. The molten metal duplicates the pattern and therefore the casted part is formed by the compacted sand.

There are two sides to the lost foam casting process: the casting, or black side, and the pattern formation, or white side. On the white side, a mold is first constructed with poured polystyrene which then hardens becoming the pattern. The black side includes inserting the pattern in the mold in the flasks, compacting it with sand, pouring in the molten metal which forms into the part as the pattern burns out, and then extracting the formed part from the flask.

3. Traditional Casting Systems

In general, casting systems have incorporated conveyor systems to move the flasks from station to station. The flasks may be placed on carriages, or gondolas, and the conveyor moves the gondola from station to station. The gondolas may or may not be linked together.

a. Accumulating Systems

In non-linked systems, or accumulating systems, the gondolas move independently from each other from one station to the next. The gondolas are able to accumulate ahead of each operating station, allowing each station to operate independently of the other. With an accumulating system, therefore, the time between metal pouring and dumping is not dependent on the time needed to complete the compaction station, which is generally the slowest operating station. Examples of an accumulating system include roller conveyors, where the gondolas are moved by rollers underneath them, and power-and-free conveyors, which use either a track or overhead rail where each gondola would engage and disengage a drive mechanism.

b. Non-accumulating Systems

Non-accumulating systems, or continuously-linked systems, were used in foundries for casting as early as 1941. *See* United States Patent No. 2,347,346, issued to F.J. Wright for a conveyor mechanism (Wright, '346 patent) (Px4). In these systems, which are still in use today, only the pouring and dumping stations are "online," or on the conveyor; the mold is formed at an "offline" compaction station. After the mold is formed, it is placed on a gondola that is moved from station to station, called indexing. The conveyor carries the gondola to the metal pouring station, and then through a cooling zone to the dumping station.

There have been many variations in the manner in which the gondolas move from station to station. What was common to all continuously-linked casting systems prior to 1987, however, was the singular fact that compaction was done offline. No continuously-linked system had all operating stations located on a single conveyor.

4. Conventional Wisdom in the Lost Foam Casting Industry Prior to 1987

Lost foam casting as initially practiced was less efficient than traditional casting methods because the compaction operation took much longer to complete. Indeed, the lost foam process was little utilized before General Motors adopted an accumulating system for use in its Massena, New York facility in 1979.

Prior to June 29, 1987, the conventional wisdom and engineering consensus in the industry was that, to have a viable lost foam casting system with all operating stations online, an accumulating system was necessary.[2] It was thought that accumulating systems allowed for the maximum production rate. Also, there was a concern that a delay in dumping could affect the quality of the casted part. All prior art identified at trial utilized accumulating systems.

Accumulating systems were complex mechanical structures that had many drives, motors, sensors, and other equipment to move the non-linked flasks from one location to the next. As such, accumulating systems required substantial downtime for maintenance, which was expensive and limited production. Prior to 1987, there were no lost foam production systems in existence that utilized a continuously-linked flask handling system like that claimed in Claim 1 of the '787 patent.

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[2] As explained in V.H. Burchell, *Production Systems for Lost Foam Castings*, Metalurgical Science & Technology, 30-1, 30-4 (1983) (Px145):

> The transportation system must have the ability to convey the flasks or 'pour-boxes' to the individual process stations, and be capable of 'accumulating' or 'queuing' them ahead of the operating stations. It is also desirable that the system allow free access to the top and sides of the flask to aid in pattern placement, pouring, and cast-cluster removal. There are many types of systems which will satisfy the requirements, but the simplest mode of transport is based on a power-and-free conveyor.

The same article is published in Volume 92 of *Transactions of the American Foundrymen's Society* (1984).

B. McMellon's Efforts

Vulcan is in the business of manufacturing metal casting systems, including lost foam casting systems. McMellon joined Vulcan in 1984 as a vice president and is now its chief operating officer. McMellon was and continues to be responsible for management, sales, marketing, process analysis, and engineering coordination of projects at Vulcan.

1. Prior to 1987

Around the summer of 1986, McMellon began exploring ways to improve the efficiency of existing lost foam casting systems by creating a simple, rugged, and dependable system with minimal downtime. McMellon's efforts looked to the creation of a continuously-linked lost foam casting system in which existing technology was appropriately modified. Vulcan already manufactured a conveyor based on United States Patent No. 4,299,269, issued to Friesen, *et al.* (Friesen, '269 patent) (Px6), for a handling system for foundry sand molds in which "[a]n intermittently moving gondola-type conveyor for handling pallet-supported foundry sand molds" moved along tracks. *See also* Wright, '346 patent (Px4.).

Essentially, McMellon developed a way of placing the compaction station online on a continuously-linked conveyor system. This was the first time all operating stations were placed online. As McMellon testified:

THE COURT:	So what you did in reality is . . . figured out how to get the compaction station online?
THE WITNESS: [McMellon]	On an interlinked gondola carrier system, yes.
THE COURT:	[S]o when the patent office examiner was looking at all of this stuff, he could have found everything in the prior art except the

compaction station online more or less[?]

THE WITNESS: More or less. [McMellon]

Tr. II, p.64-65.

The first evidence of record of McMellon's development efforts is a drawing dated December 23, 1986, displaying the "General Arrangement Automatic Flask Handling Line" for Simsco Columbiana (Simsco) (Dx96). Simsco, a customer of Vulcan, had ordered an accumulating system that called for an overhead monorail to handle the flasks. Vulcan persuaded Simsco to accept a continuously-linked casting system with all operating stations online (Dx95).

2. Saturn

About the same time McMellon was selling Simsco his new casting system, the Saturn Division of General Motors (Saturn) solicited proposals for a metal casting system for a new automobile assembly plant in Spring Hill, Tennessee. Phase I of the solicitation process looked only to a system denominated "Lost Foam Casting Lines" (Px247). Saturn did not describe the type of conveyor system it desired or specify that the stations be online.

Following submissions by prospective suppliers, including Vulcan and FATA, Saturn went to what it called "Phase II Proposal" (Px248). Once again, Saturn did not particularize the conveyor system that it required or specify that the three stations be online. Saturn said it was looking for "creativity, innovative cost effective ideas, management flexibility, quality and reliability of equipment" (Px248) (*See also* Dx263, 264, and 265).

By the end of January 1987, in response to Saturn's Phase II request, Vulcan submitted a proposal for a continuously-linked lost foam casting system (Px190). Saturn issued a purchase order for three of Vulcan's

casting systems in April 1988. *See* McMellon, Tr. I, p. 103; Tr. VII, p. 51.

3. Commercial Success

Vulcan began marketing the lost foam casting system claimed by the '787 patent under the trade name "TruFoam." General Motors purchased six additional TruFoam systems from Vulcan after Saturn purchased three TruFoam systems. Since January 1, 1987, Vulcan has dominated the market for lost foam casting systems. Vulcan has sold thirty-three TruFoam systems, representing about eighty percent of the forty-one production lost foam systems sold worldwide during the relevant time period. In the United States, Vulcan's sales of TruFoam systems represent ninety-five percent of the lost foam systems purchased since 1987. *See* Px33, Px219, Px220.

C. Saginaw

1. General Motors Inquiry

On February 13, 1997, General Motors issued an inquiry (Px38) for nine separate lost foam casting systems, most of which were to go to Saginaw, "in order to produce block and cylinder heads castings." The specification stated in part:

> 1. The pour box, flask handling system will be a synchronous, positive indexing, palletized type conveyor system. Roller conveyors or power-and-free conveyors will not be acceptable.
>
> 2. The index system will consist of a hydraulically actuated cylinder with accel. and decl. control on the movement.
>
> . . .
>
> 4. The system must have a positive locating and locking device to maintain line location control at all times.

Px38, Section 4.1. As far as Vulcan knew, only TruFoam met these requirements, and as far as Vulcan was concerned TruFoam was the '787 patent. Alfredo Dal Pan (Dal Pan), Technical Director of FATA (Italy), and Giorgio Donini (Donini), General Manager of FATA (US), had seen the Vulcan system installed at Saturn prior to the February 1997 inquiry from General Motors. *See* Dal Pan, Tr. VI, p. 134; Donini, Tr. III, pp. 33-36. Dal Pan, who was involved in design of the casting line sold to Saginaw, testified:

Q. Did you follow the specifications that GM gave you to build the system?

. . .

A. I followed the specification that GM gave us which indicated the type of conveyor they wanted, the type of conveyor GM wanted.

. . .

THE COURT: [T]he first time you saw what GM wanted was in Plaintiff's Exhibit 38; is that correct? . . . [I]ts General Motors Power Train Specification for the design and build of the lost foam casting line February 13. . . .

THE WITNESS: Si.

THE COURT: Were you the first at FATA from a technical standpoint to consider this?

THE WITNESS: Yes, sir.

THE COURT: Okay. And you read 4.0, Scope of Work, and you read 4.1. "The pour box flask-handling system will be a synchronous positive-indexing palletized-type con-

veyor system. Roller conveyors or power-and-free conveyors will not be accepted." . . . At the time you read that had FATA ever assembled a system that met that specific requirement . . . for lost foam?

THE WITNESS: No.

THE COURT: So this was something new to FATA?

THE WITNESS: As a construction, yes.

THE COURT: As a construction. Were you aware whether or not worldwide there was any lost foam casting system in which the pour box flask-handling system was a synchronous, positive-indexing, palletized-type conveying system?

THE WITNESS: Yes.

THE COURT: You knew there was one. Where?

THE WITNESS: In Saturn.

THE COURT: At Saturn. So you were aware that what GM was calling for was the system that Vulcan had installed at Saturn.

THE WITNESS: As far as conceptually, it was similar to the system that was buiit by Vulcan.

Dal Pan, Tr. VI, pp. 132-134.

General Motors received bids on the project in July 1997. On August 1, 1997, General Motors advised Vulcan that the nine lost foam casting lines would be awarded to FATA.

McMellon wrote a letter to General Motors dated August 6, 1997, in which he stated that Vulcan "must

officially protest the award" to FATA because "[t]he inquiry specifically described systems incorporating the design known as the TruFoam, which is proprietary to and patented (no. 4,736,787) by Vulcan." General Motors forwarded McMellon's letter to FATA on August 12, 1997, stating that "[w]e trust you will look into, and take care of, this matter" (Px27).

2. FATA

As noted, FATA did not sell a continuously-linked lost foam casting system until its sale to Saginaw. Dal Pan testified:

> Q. [D]id you not testify that FATA had never before manufactured a lost foam casting system like the one that they have now sold to GM Saginaw?
>
> . . .
>
> A. Yes.

Tr. VI, p. 108. Indeed, until FATA bid on the Saginaw system, FATA sold the same system it proposed in response to Saturn's Phase II request, which was a casting system in which the compaction station was offline (Dx268).[3]

FATA showed the continuously-linked lost foam casting system it was selling to General Motors at an open house for its prospective customers on September 1, 1998. On September 15, 1998, after McMellon received a report on the system FATA displayed at the open house, Vulcan filed this lawsuit.[4]

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[3] *See* Dx267, 268 and 269B, which are drawings of the casting systems proposed by FATA to Saturn. This system is best described in a presentation FATA made to the XVII Foundry Congress of the National Foundry Association in September 1984 in Italy, *Systems And Machinery For the Production of Castings Using Expendable Models Made of Expended Polystyrene* (Dx245A).

[4] As discussed below, FATA limited its infringement defense to comparing its structure to the corresponding structure in the '787 patent regarding the track means, registration means, and drive means. A de-

III. THE '787 PATENT

The '787 patent, particularly Claim 1,[5] describes a conveyor system for lost foam casting that has all of the operating stations online, including the compaction station.[6] A hydraulic ram mechanism moves the continuously-linked gondolas intermittently through indexed positions at each station along the conveyor track. The gondolas carry flasks that are registered on the gondola so that they are in proper alignment at each of the stations. The flasks move through three stations. At the first station – the compaction station – the mold is formed and foundry sand is inserted in the flask and compacted around a polystyrene pattern. At the second station – the pouring station – molten metal is poured into the flask. At the third station – the dumping station – the solidified cast and sand are dumped out. The system is computer controlled and uses conventional lost foam casting equipment.

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tailed description of the relevant structures of the accused device is set forth in the Court's infringement analysis below.

[5] The '787 patent includes 19 claims overall, with Claim 1 and Claim 14 being independent.

[6] As described in its Abstract, the '787 patent covers:

> A conveyor system for use in a lost foam casting system connects a plurality of stations where operations necessary to the process are carried out. The system utilizes an interconnected train of open frame gondolas supported on a set of elevated parallel horizontal rails forming a closed loop. The gondolas each support a flask wherein molds are placed and sand molds are compacted, with the flasks being removable from the gondolas as necessary for the particular operation. A programmable controller senses the status of the system and provides signals to operate the conveyor and associated components.

A. Claim 1

Claim 1, the claim-in-issue, has 11 limitations, three of which are of concern here:

Limitation 2:	A closed curvitinear track means.
Limitation 8:	With each gondola including means for registering said flask [on the gondola].
Limitation 10:	Drive means for effecting intermittent movement of the mold carriers between index positions along said track means.

Each is a means-plus-function limitation. *See* 35 U.S.C. § 112, ¶ 6. The Court construed these limitations as follows:

> Limitation 2 is any type of closed curvilinear track, including parallel rails or monorail.
>
> Limitation 8 requires that each gondola include structure which cooperates with structure on a flask to register the flask for alignment with the compaction station, including, but not limited to, two posts and two receptacles, regardless of whether the posts or receptacles are located on the gondola or flask. The limitation relates to a method of adjusting the flask in relation to the gondola to assure constant alignment throughout the passage of the flask through the operating stations of the system. The limitation does not relate to engagement between the flask and compaction equipment. The registration assures that each time the flask is lifted from the gondola, it is placed back on the gondola in the exact same relationship.
>
> Limitation 10 is a hydraulically driven carriage or Geneva movement to engage one gondola and move the entire continuous train of gondolas about the track and stop the train with gondolas in the opera-

> ting stations, with stops and movement responsive to a controller.

See Corrected Order on Claim Construction; Memorandum on Claim Construction.

The corresponding structure, 35 U.S.C. § 112, ¶ 6, for each of these limitations is described in the *Corrected Order of Corresponding Structures.* Attached as Exhibits D, E, and F are charts displaying Limitations 2, 8, and 10. The charts include the Court's construction, the corresponding structure as described in the specification, as well as the corresponding structure for the casting system FATA sold Saginaw.

B. Compaction Station

Also relevant to the decision is Limitation 3 of claim 1, "a loading and compaction station." The specification and drawings of the '787 patent call for a vertical compactor, i.e., a compactor which engages the flask from below. *See* Fig. 3; col. 3, lines 3-6. It is important to point out, however, that the specification states:

> [T]he equipment available for use in the compaction station 12 is available from a variety of vendors and each type engages the flask 22 in a different manner. Therefore, a specific flask configuration will be discussed herein *as an example* of a flask 22 having features which allow it to be used in the present system.

Col. 2, lines 63-68 (emphasis added). In 1986 vertical and horizontal compactors were commercially available.[7] Hence the Court construed the limitation "a loading and compaction station" as follows:

> [A]ny loading and compaction station which was known in the art on June 29, 1987 (the filing date of

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[7] For example, Outboard Marine Corporation manufactured and, through licensees, supplied horizontal compactors for use in foundry operations, and General Kinematics Corporation supplied vertical compactors for use in foundry operations.

the '787 patent) including vertical, horizontal and other compactors.

C. References

The references cited in the '787 patent are:

- The Wright, '346 patent (Px4);
- United States Patent No. 3,565,239 issued to Walker, *et al.*, on February 23, 1971, covering a dishwashing machine with continuous horizontal conveyor means (Px5);
- The Friesen, '269 patent (Px6);
- United States Patent No. 4,402,393 issued to William C. Kent on September 6, 1983, covering a conveyor system, including a number of closely spaced pallets (Px7).

None of these references disclose a metal casting system in which all of the stations are online. One reference discloses flask/carrier registration in the manner called for by the '787 patent and particularly Claim 1.

IV. THE CASE IN COURT

A. Proceedings Prior to Trial

1. Request for Preliminary Injunction

Vulcan filed suit in the Northern District of Alabama on September 15, 1998. Almost simultaneously with the filing of suit, Vulcan asked for a preliminary injunction, taking the position that FATA had simply copied Vulcan's Saturn installation in response to Saginaw's solicitation for bids. The case was transferred to the Eastern District of Michigan on FATA's motion before consideration of the motion for preliminary injunction.

The Court conducted a one-day hearing on the motion on November 2, 1998. Because the casting system sold by FATA to Saginaw was not likely to go online for several months, the Court decided that prudence called for an early trial date. If improvidently granted, a prelimi-

nary injunction in a patent case can have adverse effects too great to be rectified because the enjoined party must look to an injunction bond or an action for damages to compensate for any loss suffered. Subsequently, the parties agreed that no additional casting systems would be delivered by FATA to Saginaw until a decision on liability.

As is its custom, the Court bifurcated liability from willfulness and damages, believing at the time that the liability issue would be resolved by a jury's decision and that determining liability was as much as should be asked of a jury at trial. The demand for jury trial was later waived, however.

2. *Markman* Hearing

The Court conducted a *Markman* hearing on January 15, 1999. *See Markman v. Westview Instruments, Inc.*, 52 F.3d 967 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370 (1996). The results of that intensive effort are memorialized in the orders and memorandum previously discussed and attached as Exhibits A, B and C. Claim 1 as properly construed is described in these exhibits as well as Exhibits D, E, and F.

3. Motion for Summary Judgment

During the course of the *Markman* hearing, FATA attempted to abort the trial by moving for summary judgment on Vulcan's claim of infringement. The Court denied the motion and did not meaningfully consider it because it was excessive. Complex patent cases are best resolved in the crucible of trial. Paper and lawyer arguments are not of the same quality as testimony and an orderly presentation of exhibits.

B. The Trial

1. Overview

The case was tried to the bench. The Court allotted 22 hours of trial time to each side, though the trial was

completed in 22 hours overall. Preliminarily, the Court denied several motions in limine filed by FATA. The motions seemed excessive in light of the fact that the trial was to be to the Court. Each party filed a glossary of terms. Each party presented its direct testimony in narrative form. *See Manual for Complex Litigation* § 22.51 (3d ed. 1995). Comprehensive exhibit lists were filed. Witness lists included a brief description of the proposed testimony of each witness. The Court required that exhibits be lodged with the Court as each witness testified.[8]

2. Vulcan's Witnesses

Testifying for Vulcan in its case in chief and rebuttal both live and by deposition were:

- Bruce McMellon — the inventor
- Harry E. Littleton — Engineering Supervisor in the Material Science and Engineering Department at the University of Alabama – Birmingham, an expert in the art of lost foam casting
- Michael Long — a FATA employee who participated in the circumstances leading to the Saginaw order
- Russell J. VanRens — an Outboard Marine Corporation (OMC) employee in research and development who had experience in lost foam casting prior to Bruce McMellon's invention (OMC held the

[8] In hindsight, the Court should have required a full set of exhibits be lodged with it in advance of trial.

	patent initially on a horizontal compactor)
• Alfredo Dal Pan —	Technical Director of FATA (Italy) and involved in design of the casting line sold to Saginaw
• Richard Grauer —	a patent law expert

3. FATA's Witnesses

Testifying for FATA in its case in chief both live and by deposition were:

• Giorgio Donini —	General Manager of FATA (US)
• Marzio Raveggi —	Chief Executive Officer of FATA (US)
• Gregory Sanders —	an independent consultant in the lost foam industry and a former General Motors employee
• Donald Caron —	a retired Saturn employee
• Parker Stroom —	Technical Director of Vulcan and a former Saturn engineer
• Lynn Hackman —	a sales engineer for Vulcan
• Robert Bond —	a sales engineer for General Kinematics Corporation, a manufacturer of compaction equipment for the foundry industry
• Paul Creed —	a Vulcan employee familiar with Vulcan's sales to Saturn of the system and a prior installation of Vulcan at Simsco

- Alfredo Dal Pan — Technical Director of FATA (Italy) and involved in design of the casting system sold to Saginaw
- Donald Wood — a patent law expert
- Murray Patz — a consultant in lost foam casting technology particularly in the mold and pattern-making aspects

4. Exhibits

Exhibits at trial included patents, models, photographs, drawings, animated videos, videos of foundry operations, display boards, literature, contract documents, quotations, specifications, and the like.

5. Testimony

Trial testimony and exhibits comprehensively described the history of casting metal parts, including the progression from individually cast parts of iron and aluminum through automation of the casting process. The advantages and disadvantages of compactors in horizontal and in vertical configurations (Dx26 and Dx27) were described. The parties also explicated the manner in which the flask registers with the gondola in the preferred embodiment of the '787 patent (Px215) and in the system sold by FATA to Saginaw (Px216), as well as pouring and extraction equipment, the two drive systems, and the conveyors (Px217 and Px218). In all, little about metal casting and its progress from individually formed molds and patterns to fully automated, green sand, and lost foam was outside of the range of testimony and exhibits when the trial concluded.

6. Absence of Testimony

Particularly significant was the absence of any testimony from a person with experience in lost foam casting currently working at Saginaw or even in any foundry.

Saginaw personnel chose FATA over Vulcan to install five new lost foam casting lines, but its persons with procurement experience who can best compare any advantage Saginaw was looking for in the casting system it purchased did not testify. There was no evidence, testimonial or written, relating to the differences in foundry operations between a lost foam casting system following the precepts of Claim 1 and the lost foam casting system that FATA sold Saginaw.

V. VALIDITY

A patent is presumed to be valid. *See* 35 U.S.C. § 282. FATA contends that the '787 patent is invalid on grounds of anticipation, 35 U.S.C. § 102, obviousness, 35 U.S.C. § 103, and failure of enablement and written description, 35 U.S.C. § 112. To overcome the presumption of validity, FATA must prove that the '787 patent is invalid by clear and convincing evidence. *See Applied Materials, Inc. v. Advanced Semiconductor Materials America, Inc.*, 98 F.3d 1563, 1569-70 (Fed. Cir. 1996), *cert. denied*, 520 U.S. 1230 (1997).

"It is well-established that the first step in any validity analysis is to construe the claims of the invention to determine the subject matter for which patent protection is sought." *Smiths Indus. Med. Sys., Inc. v. Vital Signs, Inc.*, – F.3d –, –, 1999 WL 498219, at *4 (Fed. Cir. July 14, 1999). As noted, this exercise is memorialized in Exhibits A, B, and C.

A. Anticipation

FATA's claim that the '787 patent is invalid under 35 U.S.C. § 102 because prior art anticipates the invention claimed has no merit.[9] "A prior art reference anticipates

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[9] In part, 35 U.S.C. § 102 provides:

> A person shall be entitled to a patent unless . . . the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent[.]

a claim only if the reference discloses, either expressly or inherently, every limitation of the claim." *Rowe v. Dror*, 112 F.3d 473, 478 (Fed. Cir. 1997). FATA did not introduce evidence of prior art that contains the limitations of Claim 1 of the '787 patent. Indeed, Donald Wood, who testified as an expert witness for FATA, admitted on cross-examination that FATA had no prior art that anticipated any claim of the '787 patent. *See Wood*, Tr. VI, p. 42.

B. Obviousness

FATA also asserts that the '787 patent is invalid on grounds of obviousness. Under 35 U.S.C. § 103(a):

> A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

The Court must "determine whether the claimed invention would have been obvious as a legal matter, based on underlying factual inquiries including: (1) the scope and content of the prior art, (2) the level of ordinary skill in the art, (3) the differences between the claimed invention and the prior art, and (4) secondary considerations of nonobviousness." *Smiths Indus.*, – F.3d at –, 1999 WL 458219, at *6 (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966)). In so doing, care must be taken to avoid using "the claims . . . as a frame, and [employing] individual, naked parts of separate prior art references . . . as a mosaic to recreate a facsimile of the claimed invention. *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1552 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). To do so would be to use "hindsight gleaned from the invention itself." *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1143 (Fed. Cir. 1985) (citing *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577 & n.14 (Fed. Cir. 1984)). As recently stated by the Federal Circuit:

> [T]here is no basis for concluding that an invention would have been obvious solely because it is a combination of elements that were known in the art at the time of the invention. Instead, the relevant inquiry is whether there is a reason, suggestion, or motivation in the prior art that would lead one of ordinary skill in the art to combine the references, and that would also suggest a reasonable likelihood of success. Such a suggestion or motivation may come from the references themselves, from knowledge by those skilled in the art that certain references are of special interest in a field, or even from the nature of the problem to be solved.

Smiths Indus, – F.3d at –, 1999 WL 498219 at *7 (citations omitted).

1. Prior Art

There was no dispute at trial as to the level of ordinarily skill in the art. It was also uncontroverted that: General Motors installed an automated, accumulating lost foam casting line in Massena, New York, using an overhead power-and-free conveyor in 1979; prior to June 29, 1987, automated, continuously-linked conveyors with pouring and dumping stations online were used in green sand casting; and similarly configured accumulating lost foam casting lines were in use prior to June 29, 1987. There was also no dispute that, on June 29, 1987, an interconnected, continuously-linked lost foam casting line as called for by Claim 1 of the '787 was not found either in the literature or on the foundry floor.

With regard to obviousness, the basic disputes were over what was prior art, the differences between the prior art and Claim 1, and what a person skilled in the art might conclude from all this. FATA attaches significance to the lost foam systems at General Motors' Rochester Products facility in Rochester, New York (Rochester Products), the Fredonia Foundry in Wisconsin (Fredonia), and John Deere Company (John Deere).

a. Rochester Products

The Rochester Products system consisted of a large turntable that carried eight flasks to the three stations by indexed movement. *See* Dx104, 105, 106. The underside of each flask had three posts placed into openings in the table so that they could be connected with three upstanding pedestals located in or underneath the compactor. The system did not use pivotally-mounted gondolas and did not have a track.

The system was experimental and not used in production. Apparently it was assembled in-house, used for a short period of time, and then abandoned. McMellon was not aware of this system. This system is not prior art because of its experimental and secret nature. Moreover, nothing in Rochester Products suggests or teaches the invention claimed in the '787 patent or in combination with the other cited art.

b. Fredonia

Fredonia's system, a conventional power-and-free accumulating system, had open frame, four-wheeled trollies, carrying flasks traveling about a closed loop of two tracks. *See* Dx338. The flasks had downwardly-extending tubular feet such that they could be aligned with vertical compaction equipment underneath the track. The trolleys were driven by a continuously-moving chain that provided intermittent movement. The three stations were online. The trolleys were not linked and some moved while others were stationary. There is nothing in Fredonia that teaches or suggests the invention claimed in the '787 patent individually or in combination with the other cited prior art.

c. John Deere

John Deere, an accumulating system which was manufactured by Vulcan in the summer of 1986, was a closed-loop roller conveyor with the three stations online. *See* Dx109, 111, 112. The system had twenty-five

flasks moving through the three stations in platoons of five each. The system included indexing and accumulation because the flasks moved individually and in groups of five. The system included vertical compaction with a roller conveyor for carrying the flasks. The flasks rested directly on the rollers; there was no separate gondola or flask carrier. Thirty-two separate drives powered the flasks. A multitude of limit switches were needed to relay information from the rollers so the flasks did not bump into each other.

McMellon testified as to John Deere:

> In 1986 Vulcan received a purchase order from John Deere to provide a powered roller conveyor lost foam casting system. As I have described in this system, the flasks were not connected in any manner and did not ride on any type of carrier. The flasks sat directly on the rollers. The flasks were flat-bottomed. This system had 32 separate drives to allow the flasks to move independently around the roller conveyor and had numerous limit switches to be able to locate the flasks and prevent them from running into each other. The John Deere system never really operated as a production system and is no longer in service.

McMellon, Tr. I, p. 92. There was nothing in John Deere which suggests or teaches the invention claimed in the '787 patent individually or in combination with the other cited prior art.

2. FATA's Argument

FATA urges that the prior art references it cited would have lead a person of ordinary skill in the art to combine them in the way described in Claim 1. Particularly, FATA's argument as to obviousness is best stated by reference to Paragraphs 137 to 139 of *Defendants' Proposed Findings of Fact Corrected Copy* filed May 14, 1999 (Defendant's Proposed Findings), and Paragraph 45 of *Defendants' Proposed Conclusions of Law* filed May 6, 1999:

137. A person skilled in the casting art in 1987 would have found it obvious to look to his own past experiences not only in lost foam systems but in green sand casting as well to find ideas for designing and/or selecting hardware for use in a lost foam casting operation. It would have been apparent to this person that both operations were highly analogous, both required conveyors to transport molding flasks in high production quantities and that both involved significant off-line operations: in the case of green sand technology this involves preparing the cope and drag and in lost foam technology this involves the manufacture of the styrofoam pattern.

138. The person of ordinary skill would also be presumed to know, in 1987, that compaction had been done on-line in lost foam systems at Massena, John Deere and Fredonia.

139. The person of ordinary skill in the casting art in 1987 would probably have preferred the more expensive accumulating line if he were trying to design or assemble a conveyor system capable of accommodating several different products. However, if he were attempting to design or assemble a smaller "dedicated" casting line, he would have favored the mechanically interconnected "daisy chain" conveyor.

45. The combination represented by Claim 1, i.e., the prior art conveyor consisting of pivotally interconnected, intermittently driven trolleys with on-line lost foam compaction and dumping stations as were used at John Deere and flask registration structure as was used at Fredonia, is a combination which would have been obvious to a person of ordinary skill in the casting conveyor technology at the time of the invention when faced with the same specific task which faced McMellon at Saturn; i.e., to propose an

> inexpensive conveyor with proven reliability at minimum expense by borrowing from existing technology. The fact that low cost and reliable operation overcame the natural desire for the flexibility of the accumulator conveyor pointed McMellon in the direction of the daisy chain conveyor.

FATA's proposed findings, even if adopted by the Court, are insufficient to carry the day for FATA. First, there is no disagreement as to the need for "significant off-line operations" as stated in Paragraph 137 of *Defendants' Proposed Findings*. As of June 27, 1987, FATA's offline operations, aside from pattern preparation, included loading and compaction.

Second, the preference for a conveyor system capable of accommodating several different products in a small, dedicated casting line, including a mechanically interconnected daisy chain conveyor, says nothing about moving the compaction station online. The '787 patent calls for compaction online; neither FATA nor any other manufacturer except Vulcan offered a continuously-linked conveyor with the compaction station online.

Third, no witness of ordinary skill in the art testified that McMellon's combination is the result of common engineering skill. The evidence of record in support of such a conclusion is certainly not clear and convincing. *See Smiths Indus.*, – F.3d at –, 1999 WL 498219, at *8 ("That knowledge *may* have been within the province of the ordinary artisan does not in and of itself make it so, absent clear and convincing evidence of such knowledge."). The conventional wisdom in the industry was that if all casting stations were to be located on a single conveyor, the flasks had to be allowed to move independently of each other and accumulate at the operating stations.

Fourth, there were significant differences between Massena, Fredonia, and John Deere and the invention described in the '787 patent. Each prior art reference

cited by FATA was an accumulating system. None of the references individually or in combination suggested the motivation to place the compaction station online and use a continuously-linked conveyor system, as McMellon did. McMellon was looking for a less costly, more efficient, and less complicated way to produce lost foam cast metal parts.

3. Secondary Considerations

Evidence of secondary considerations such as commercial success and copying "may often be the most probative and cogent evidence in the record." *Stratoflex Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983). Vulcan has the burden of establishing the commercial success of the '787 patent reduced to practice in this regard:

> For objective evidence [of nonobviousness] to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the claimed invention. A prima fade claim of nexus is generally made out when the patentee shows both that there is commercial success, and that the thing (product or method) that is commercially successful is the invention disclosed and claimed in the patent.

In re GPAC, Inc., 57 F.3d 1573, 1580 (Fed. Cir. 1995) (citations omitted) (internal quotation marks omitted).

FATA did not counter the evidence that Vulcan's TruFoam system is the invention claimed in the '787 patent. Further, Vulcan established that the TruFoam system was a commercial success. As noted, Vulcan has dominated the market for lost foam casting systems beginning with the sale to Simsco followed by the acceptance of Saturn. Since January 1, 1987, Vulcan has sold about eighty percent of the lost foam systems purchased worldwide, and ninety-five percent of the lost foam systems purchased in the United States. Vulcan's commercial success is further buttressed by the specifications for Saginaw. Advertising was not a factor.

Vulcan also established copying on the part of FATA. When Saginaw requested a synchronous, continuously-linked casting system in 1997, the only such casting system was being made by Vulcan. Although the Saginaw specification appeared to be generic, it was simply an artful way to describe the casting system claimed in the '787 patent without expressly calling for the successful bidder to be Vulcan or a Vulcan licensee. FATA had never before manufactured such a lost foam casting system similar to the one in the Saginaw specification. *See* Dal Pan, Tr. VI, p. 133. Dal Pan, however, testified that he was aware of such a system at Saturn, which was manufactured by Vulcan. *See* Dal Pan, Tr. VI, pp. 132-34.

4. Conclusion

The conventional wisdom and engineering consensus on June 29, 1987, in lost foam casting was that, if all operating stations were to be located on a single conveyor, an accumulating system had to be used because it allowed the flasks to move independently of each other and to accumulate at the operation stations. This is the reason why no lost foam casting operation used a continuously-linked conveyor system with the compaction station online like that claimed in the '787 patent before Vulcan. *Cf. Monarch Knitting Mach. Corp. v. Sulzer Morat GmbH*, 139 F.3d 877, 885 (Fed. Cir. 1998) ("General skepticism of those in the art . . . is also 'relevant and persuasive evidence' of nonobviousness." (citing *Gillette Co. v. S.C. Johnson & Son, Inc.*, 919 F.2d 720, 726 (Fed. Cir. 1990)). None of the lost foam prior art discussed above made Claim 1 obvious. Each of the lost foam prior art systems used some form of accumulating system. In each instance the flasks were not linked together and were independent of each other. Additionally, TruFoam, which incorporates the teachings of Claim 1, was a commercial success. The motivation for the purchase of the TruFoam system after Saturn was the installation at Saturn.

Accordingly, in its attack under 35 U.S.C. § 103, FATA did not come close to rebutting the statutory presumption of validity, 35 U.S.C. § 282, that attaches to the '787 patent by establishing that Claim 1 of the '787 patent was invalid by clear and convincing evidence.

C. Enabling

FATA also argues that the '787 patent is invalid under 35 U.S.C. § 112, ¶ 1, which provides in pertinent part:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same . . . .

In *Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473, 1478-80 (Fed. Cir. 1998), the only case cited by FATA in support of its § 112, ¶ 1 argument, the Court of Appeals for the Federal Circuit held the claim invalid because it was broader than the disclosure: the disclosure unambiguously limited the location of a control to a console, but the claim was directed to a control outside the console. In turn, Vulcan cites *PPG Indus., Inc. v. Guardian Indus. Corp.*, 75 F.3d 1558, 1564 (Fed. Cir. 1996), where the Federal Circuit stated that "to be enabling, a specification 'must teach those skilled in the art how to make and use the full scope of the claimed invention without 'undue experimentation,'" and *John Hopkins Univ. v. CellPro, Inc.*, 152 F.3d 1342, 1361 (Fed. Cir. 1998), in which the Federal Circuit noted that enablement requirement is met if the identification "enables any mode of making and using the invention."

1. FATA's Argument

FATA argues that the '787 patent is invalid under § 112, ¶ 1 due to (1) the lack of detail in the specification, i.e., some level of software or programming regarding the programmable microprocessor identified in the '787 patent at col. 1, line 33 and col. 4, lines 48-66, (2)

the failure to include as a limitation in Claim 1 the programmable controller, and (3) the failure to include as a limitation in Claim 1 a continuous chain of gondolas. No evidence of record, other than McMellon's acknowledgment of the need for the programmable controller or that a good deal of mathematics is required, is cited in support of the argument. Indeed, minimal text is devoted by FATA to this argument in its papers.

2. Discussion

The Court's construction of Limitation 10 of Claim 1, "drive means for effecting intermittent movement of the mold carriers between indexed positions along said track means" expressly includes "with stops and movement responsive to a controller." *Corrected Order on Claim Construction*, pp. 3-4. The *Order of Corresponding Structures* expressly references a programmable controller in Limitation 10. Murray Patz (Patz), a witness called by FATA who claimed to be a person of ordinary skill in the art, admitted he knew how the controller system would work. *See* Patz, Tr. VI, pp. 135-136; Tr. VII, pp. 42-43.

Additionally, the specification of the '787 patent expressly describes "a controller which may be a programmable controller." Col. 4, lines 48-63. As to the asserted lack of continuous claim of gondolas, Limitation 9 of Claim 1 has been construed by the Court to "include any pivotal connection between each adjacent gondola in a closed loop . . . ." This clearly references a continuous chain of gondolas.

3. Conclusion

However looked at, the requirements of 35 U.S.C. § 112 have been met by the specifications and disclosures in Claim 1 of the '787 patent. This case is too important to Vulcan and to FATA for throw-away or truncated argument. FATA has failed to meet its burden to prove by clear and convincing evidence that Claim 1 of the '787 patent is invalid under § 112, ¶ 1.

VI. INFRINGEMENT

At the final pretrial conference, FATA agreed to restrict its defense on the charge of infringement.

> MR. YOUNG: We are going to defend the infringement charge only on the three means plus function limitations that you have found in each of the two claims. We will not attempt to distinguish on the other limitations. We will address in each of the three means plus function limitations the structural differences between the corresponding structure in the patent and the actual accused structure. We will limit our proofs to that, and we are prepared to do that. The others we're conceding based on your interpretation. We'll hold out the belief that at least one limitation should have been construed as a means plus function limitation, but that's by us, we're not going to argue that anymore. You've made a decision on that. We're going to go with it.
>
> The only three distinguishing features will be . . . the track means, the registration means, and the drive means [in Claim 1]. There are very substantial structural differences in all three of those areas.
>
> MR. YOUNG: We will concede that the functions are met. If that were the end of the test, we wouldn't be arguing infringement, but we've got to compare structure and that's where we'll be.

(Tr. 3/4/99, pp. 22-23, 38).

Therefore, the decision on infringement relates to the elements of the track means, the registration means,

and the drive means of Claim 1. The Court will compare the structures of the track, registration and drive of the casting system sold by FATA to Saginaw to the corresponding structures described in the specifications.

A. Legal Principles

Under 35 U.S.C. § 271:

> [W]hoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States . . . during the term of the patent therefor, infringes the patent.

The infringement analysis is based on the scope of the claim-in-issue as a measure of the invention and is not confined to the particular mode of use or preferred embodiment described in the specification. *See Transmatic, Inc. v. Gulton Indus.*, 53 F.3d 1270, 1277 (Fed. Cir. 1995).

As noted, the track means, registration means, and drive means limitations are written in means-plus-function form and are subject to the requirements of 35 U.S.C. § 112, ¶ 6, which provides:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

In the context of § 112, ¶ 6, "[t]he proper test is whether the differences between the structure in the accused device and any disclosed in the specification are insubstantial." 145 F.3d at 1309. "Functional identity and either structural identity or equivalence are both necessary." *Odetics, Inc. v. Storage Tech. Corp.*, – F.3d –, –, 1999 WL 455530, at *4 (Fed. Cir. July 6, 1999). More specifically:

> The content of the test for insubstantial differences under § 112, ¶ 6 thus reduces to "way" and "result."

> That is, the statutory equivalence analysis requires a determination of whether the "way" the assertedly substitute structure performs the claimed function, and the "result" of that performance, is substantially different from the "way" the claimed function is performed by the "corresponding structure, acts, or materials described in the specification," or its "result." Structural equivalence under § 112, ¶ 6 is met only if the differences are insubstantial; that is, if the assertedly equivalent structure performs the claimed function in substantially the same way to achieve substantially the same result as the corresponding structure described in the specification.

Id. at *5 (citations omitted).

B. Track Means

Limitation 2 of Claim 1 claims "a closed curvilinear track means." The corresponding structure in the '787 patent is a closed curvilinear pair of rails. The function of the track is to provide a closed loop upon which gondolas ride through the lost foam operating stations. FATA conceded that its track performs the same function as the track disclosed in the '787 patent. Even though FATA appeared to have abandoned its claim that its rail system was substantially different in final argument, *see* 4 Tr. VIII, pp. 39-40, the Court will discuss why the differences in structure are insubstantial.

The casting system sold by FATA to Saginaw uses a closed curvilinear pair of tails. The rails are oval in shape with a linear section and a curved section. The rails support the gondolas as they move from station to station. Saginaw also includes an inner set of rails that prevents lateral movement of the gondolas. FATA argues that the inner rails are part of the track structure and thus there is more than an insubstantial difference between Saginaw and the '787 Patent.

FATA's argument has no merit. The inner rails are not part of the track structure; they do not support the gondolas in any manner. *Cf. Chiuminatta*, 145 F.3d at

1308-09 (indicating that structural details unrelated to the cited function are not what the statute contemplates as structure corresponding to the recited function). Rather than provide a closed loop upon which gondolas ride through the lost foam operating stations, the inner rails prevent lateral movement of the gondola. As Gregory Sanders, a FATA expert, testified at trial on cross-examination:

> Q. Now, all of that [discussion regarding the inner rails] is about the gondola and its interaction to keep it on the track, right?
>
> A. Yes.
>
> Q. Okay. That's not talking about what's supporting the gondola, is it? What's supporting the gondola is two tracks, right? What's supporting this one is two tracks?
>
> A. Yes.
>
> Q. Right, same thing, two tracks supporting the gondola?
>
> A. Yes.
>
> Q. And these two tracks in both instances form a closed loop all the way around, don't they?
>
> A. Yes, they do.

Sanders, Tr. III, pp. 104-05. Accordingly, the Court finds that the Saginaw system has the same structure as the track means of Claim 1 of the '787 patent.

Alternatively, even if the inner rails are considered part of the structure, they represent an insubstantial difference because they add nothing of significance to the FATA system. Contrary to FATA's assertion, the inner set of rails do not prevent the use of a vertical compactor. The Court gives great weight to all of McMellon's testimony, including the following on direct:

> Q. Mr. Young [FATA's counsel] raised the question of whether you could use a vertical compactor with

this type of a track arrangement [that has the inner set of rails].

A. Absolutely.

Q. You can?

A. Certainly.

Q. How can you do that?

A. It comes up between the rails the same as it does on the patented system. I could give that to one of the guys in my shop and they would have a vertical compactor on it in one day.

McMellon Tr. I, p. 138-39.

The Claim 1 structure is interchangeable with FATA's structure. There is no evidence FATA experimented with its rail system or did any more than take the existing system from systems previously delivered to its customers. Known interchangeability may be indicated by a lack of evidence that the alleged infringer conducted independent experimentation with respect to the accused structure. *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 36 (1997). Moreover, there is no evidence that suggests in any way the inner rails played a role in the determination at Saginaw to choose FATA over Vulcan.

C. Registration Means

Limitation 8 of Claim 1, the registration means, properly construed calls for structure on the gondola corresponding with structure on the flask for proper alignment with the compaction station and allows for the posts and receptacles to be located on the gondola or on the flask.[10] If the flask is properly registered on the gondola, it will come into proper alignment with the

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[10] FATA has persistently argued that a vertical compactor is part of the structure of the registration means and that the manner of engagement between the flask and the compactor is also part of the registration means. The Court in construing this limitation decided to the contrary.

compaction station. FATA does not dispute that its registration structure performs the same function as the corresponding structure in the '787 patent.

The corresponding structure in the '787 patent is a receptacle on the gondola to receive two posts on the flask.[11] The Saginaw registration structure is a pair of posts located on each gondola that mate with receptacles located on each flask. The posts assure proper location of the flask for alignment with the compaction station. The differences in registration are displayed in Px215 and Px216. FATA argues that the differences in structure are more than insubstantial.

The Court disagrees with FATA. The placement of the posts on the gondola rather than the flask is an insubstantial difference. It does not matter from a mechanical engineering standpoint whether the posts or receptacles are located on the gondola flask. Harry Littleton, an expert in the art of lost foam casting, testified that "pin and socket registration is well known, anyone of ordinary skill in the art would know to interchange the male and female parts to get the same function and results." Littleton, Tr. II, p. 93. Giorgio Donini, general manager of FATA, admitted that it made no difference whether the posts were on the gondola or on the flask. *See* Donini, Tr. III, p. 43. Donald Wood, FATA's patent law expert, has testified that it makes no difference in the infringement analysis whether the posts are on the gondola or on the flask. *See* Wood, Tr. VI, pp. 54-55.

The Claim 1 structure and the structure at Saginaw are interchangeable. *See* Sanders Tr. III, p. 119. There is no evidence that FATA experimented with flask and gondola configurations or did any more than take existing gondolas and flasks used in its lost foam casting systems in production or previously sold. *See Warner-Jenkinson*, 520 U.S. at 36; *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 609 (1950) (denoting

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[11] The posts have also been referred to as pins during the course of the proceedings.

that a difference in structure is insubstantial where those of ordinary skill in the art knew the accused structure was interchangeable with the structure described in the patent) (cited in *Chiuminatta*, 145 F.3d at 1309-10). Moreover, there is no evidence that the manner of registration of the flask and gondola played a role in the determination at Saginaw to choose FATA over Vulcan. The placement of the posts on the gondola rather than the flask adds nothing of significance to the accused device.

At most, the difference in flask and gondola configurations may be a slight improvement because flasks with receptacles are easier to store than flasks with posts. FATA, however, cannot avoid infringement based on this insubstantial change that nothing of significance. *See Valmont Indus., Inc. v. Reinke Mfg. Co.*, 983 F.2d 1043 (Fed. Cir. 1993) ("In the context of § 112 . . . an equivalent results from an insubstantial change which adds nothing of significance to the structure, material, or acts disclosed in the patent specification.").

The location of the posts and receptacles is an insubstantial difference. Regardless of the location, the posts and receptacles on the accused device perform the same function in the same way to achieve the same result as that performed by the corresponding structure in the '787 patent. *See Odetics*, – F.3d at –, 1999 WL 455530, at *5.

D. Drive Means

FATA principally focused on the differences between its driver and the drive means, Limitation 10 of Claim 1.

1. The '787 Patent

The drive means, Limitation 10, reads as follows:

> Drive means for effecting intermittent movement of the mold carriers between indexed positions along the track means.

The Court construed this to mean:

> A hydraulically driven carriage or Geneva movement to engage one gondola and move the entire continuous train of gondolas about the track and stop the train with the gondolas in the operating stations with stops and movement responsive to a controller.

Corrected Order on Claim Construction, p. 3-4.

The Court found the corresponding structure as a hydraulically driven carriage, or Geneva movement, with latch, a stop, a plurality of limit switches and a programmable controller. In the patent specifications,[12] the driver is essentially a hydraulically driven carriage that carries a latch member pivotally mounted such that it can engage the gondola at the surface formed by the clevis junction of one gondola to another to urge the train of gondolas forward when the hydraulic cylinder extends. When the drive carriage is returned to its initial position, the latch member pivots about a horizontal axis to pass by the next engagement clevis that will be

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[12] The Court found the corresponding structure in the specification as:

> The clevis-like members 38 of the gondolas 19 are more than mere connections between the gondolas. They are also the point at which force is applied by the driver 21 to move the train of gondolas about the track 11. The driver 21 is shown in Figure 6 as a hydraulically driven carriage 42 which moves parallel to the linear track section as shown in Figure 2 . . . . In the illustrated embodiment, the carriage carries a latch member 43 which is pivotally mounted and biased for movement about a horizontal axis parallel to the track 11 and has the rear portion thereof beveled. As the latch 43 is retracted, the beveled rear portion engages the clevis-like member of the next gondola 39 and acts like a cam surface to pivot the latch 43 outwardly as the carriage 43 returns to its initial position. A shock-absorbing stop 45 is provided forwardly of the driver to ensure that the train stops at the proper position by engaging the gondola at the end of one increment of travel . . . . A plurality of limit switches 47 are mounted on the driver 21 and the stop 45 to generate signals indicative of the carriage position and the stop position, as well as the speed of the carriage 42 . . . . The aforementioned limit switches 47 and 58 all provide signals to a controller 61 which may be a programmable microprocessor.

See also Figures 2 and 6 of the '787 patent.

engaged on the next cylinder stroke. A stop, or shock absorber, is pivotally mounted at the end of the cylinder stroke to engage the clevis and insure that the train of gondolas stops at the proper position. The stop pivots about a horizontal axis out of the way of the clevis during the first part of each drive cylinder stroke. Limit switches are located at the beginning and end of the cylinder stroke. The switches send a signal to the programmable controller, which actuates the drive cylinder and coordinates the actions of the system components.

2. Saginaw

The drive system for the system FATA sold Saginaw was designed by FATA in 1977. Dal Pan testified:

> Q. [Y]ou used a driver that basically relied on your old concepts that you knew was tried and true and proven?
>
> A. Yes sir.

Dal Pan, Tr. VI, p. 112.

In particular, Saginaw uses a hydraulically driven carriage mounted beneath the straight section of the track. The hydraulic cylinder is controlled by a microprocessor. The carriage carries a pair of levers or latches that are pivotally mounted for selective movement about a horizontal access perpendicular to the track. A drive block is affixed beneath each trolley such that one of the levers pivots about the horizontal axis to engage the block and push the train. The other pivotally mounted lever engages the block to bring the trolley to a stop at the end of the indexing stroke. Both must retract to permit the carriage to return to the initial position. A secondary clamping mechanism provides fine adjustment along the length of the track if needed, although its primary function is securing. The secondary clamp appears to have no discernible effect on the trolley in action.

3. Comparison

The two structures are essentially the same; the differences are insubstantial. The accused system has a hydraulically driven carriage, a latch for pushing the train of gondolas, a stop for ending the forward motion, a plurality of limit switches to signal the position of the cylinder, and a programmable controller that actuates the drive cylinder and coordinates the actions of the system components. Vulcan's Proposed Finding of Fact 112 best compares the elements of each as follows:

Comparison of Features

Corresponding Structure	*FATA Device*
(1) Hydraulic cylinder	(1) Hydraulic cylinder
(2) Carriage at end of cylinder	(2) Carriage at end of cylinder
(3) Pivoting latch or lever to engage the gondola	(3) Pivoting lever to engage the gondola (back lever or gripper)
(4) A pivoting stop (shock-absorbing stop or lever	(4) A pivoting stop (front lever of gripper)
(5) Plurality of limit switches	(5) Plurality of limit switches
(6) Programmable controller	(6) Programmable controller

Although features of FATA's drive mechanism look different from the corresponding structure because FATA uses a gripper with a front and back lever instead of a separate latch and stop, the gripper is an insubstantial difference from a latch and stop. FATA's gripper rides on the carriage at the end of a hydraulic cylinder. The back lever of the gripper engages a gondola. *See* Dal Pan, Tr. VI, pp. 115-16; Patz, Tr. VII, pp. 39-40. When the hydraulic cylinder extends, the back lever pushes the entire train of gondolas forward. *See* Littleton, Tr. II, pp. 95-96; Dal Pan, Tr. VI, pp. 115-16; Sanders, Tr. III, p. 130. At the end of the cylinder stroke, the front lever of the gripper acts as a stop, and stops the forward

movement of the gondolas. *See* Littleton, Tr. II, p. 96; Dal Pan, Tr. VI, pp. 115-116; Sanders, Tr. III, pp. 124-26. Before the hydraulic cylinder retracts, both levers of the FATA gripper open by pivoting about a horizontal axis to get out of the way of the gondola. To engage the next gondola, the levers of the gripper close by pivoting about a horizontal axis. *See* Dal Pan, Tr. VI, pp. 122-24. The fact that FATA's gripper device allows the train of gondolas to be reversed does not relate to the function claimed in Limitation 10 of Claim 1. This is simply an additional function that FATA's drive structure can perform.

The FATA drive mechanism also has limit switches at the beginning and end of the cylinder stroke that send signals to a programmable controller that actuates the drive cylinder and coordinates the actions of the system components. *See* Dal Pan, Tr. VI, pp. 126-27; Dal Pan, Dep., pp. 87-88; Px 180, 181; Patz, Tr. VII, p. 40.

On June 29, 1987, it was well known by those of ordinary skill in the art that the FATA gripper mechanism was readily interchangeable with the latch and stop disclosed in the corresponding structure. Indeed, Vulcan has used a gripper on a number of occasions prior to FATA building its system. The Court finds the testimony of McMellon and Littleton credible and extremely persuasive in this regard. McMellon testified:

> It is designer's choice whether to use the type of latch and stop described in the patent or the gripper device used by FATA.
>
> The gripper used by FATA has been commercially available well before June 29, 1987. It was well-known by those knowledgeable of conveyors that a gripper could be substituted for the latch and stop described in the patent. The two are completely interchangeable. It makes no difference to the invention which device is used. The invention will work the same.

> The latch and stop described in the patent were used because they are simpler than a gripper. However, use of a gripper is an insubstantial change from the latch and stop described in the patent. Both perform the same function in substantially the same way and achieve identical results. In fact, Vulcan used a gripper at the end of a hydraulic cylinder at Saturn in place of the latch and stop because the Saturn line were heavier systems.

McMellon, Tr. I, p.134. Littleton testified:

> The gripper arrangement presents merely an insubstantial difference between the camming latch and the action used in the '787 patent. Both the latch and stop as described in the patent specification and the gripper mechanisms are well known in the art and readily interchangeable. In fact, Vulcan has used a gripper mounted on its drive carriers to move the train for a number of years. I have observed the Vulcan gripper mechanism at Vulcan's installation at Saturn. Both of these engagement mechanisms perform the same function in the same way and achieve the same results; that is, to engage the gondola or trolley and move the entire train of gondolas about the track and stop the train with the gondola in the operating positions – stations. The two engagement mechanisms which are two of many similar mechanisms which could have been used to perform the same function, and they are interchangeable.

Littleton, Tr. II, pp. 97-98.

Further, the fact that the FATA drive mechanism is located between the track, rather than on the side of the track, is irrelevant to an infringement analysis because both push along the pivot axis of the respective gondola connection. Thus, the location of the drive mechanism does not affect its function. *See* Sanders, Tr. III, pp. 120-21.

4. Conclusion

The two drivers are interchangeable. There is no evidence of experimentation by FATA. FATA utilized an existing driver system. There was no evidence that in any way the differences in the driver systems played a role in the determination at Saginaw to choose FATA over Vulcan. The differences are insubstantial.

VI. CONCLUSION

FATA copied Saturn in supplying Saginaw. Saturn's lost foam casting system was manufactured by Vulcan, and Saturn was covered by the '787 patent. It is interconnected continuously-linked lost foam casting system meeting the limitations of Claim 1 of the '787 patent. The asserted differences in the structures of the three means-plus-function limitations in Claim 1 are at best insubstantial. FATA infringes Claim 1 of the '787 patent.

This case will now go forward with a trial on willfulness and appropriate relief. The deputy clerk will set the date after consultation with the parties. The trial on willfulness and damages and/or injunctive relief should take far less preparation and far less time than the trial on infringement because it appears that most of the facts can be stipulated.

As to the question of interim injunctive relief, the parties should discuss the matter first and then Vulcan can, if necessary, move for such relief. As to an accounting for damages, most, if not all, of the relevant facts can likely be stipulated.

/s/ AVERN COHN
Avern Cohn
United States District Judge

DATED: Aug. 10, 1999.
Detroit, Michigan

APPENDIX C

UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION

No. 98-74495

VULCAN ENGINEERING CO., INC.,
Plaintiff,

v.

FATA ALUMINIUM, INC., AND FATA GROUP, S.P.A.,
Defendants.

FINAL JUDGMENT IN A CIVIL CASE

Decision by Court. This action came to trial or hearing before the Court. The issues have been tried or heard and a decision has been rendered.

IT IS ORDERED AND ADJUDGED that a FINAL judgment be and hereby is entered in favor of VULCAN ENGINEERING CO., INC., and against FATA ALUMIN[I]UM, INC. and FATA GROUP, S.p.A., jointly and severally in the form of lost profits and prejudgment interest in the amount of two million four hundred sixty five thousand six hundred ninety six dollars ($2,465,696.00).

FURTHER, the Court finds FATA's infringement was not willful.

FURTHER, the Court finds that it is not an exceptional case and FATA did not engage in litigation misconduct.

This judgment incorporates the Partial Judgment on Liability entered August 14, 2000 nunc pro tunc, 8/10/00 and the Permanent Injunction entered March 28, 2000.

Date: August 30, 2000 NUNC PRO TUNC DATE 8/1/00

APPENDIX D

SUPREME COURT OF THE UNITED STATES
OFFICE OF THE CLERK
WASHINGTON, DC 20543-0001

April 29, 2002

Mr. Peter D. Ehrenhaft
Miller & Chevalier
655 Fifteenth St., NW, #900
Washington, DC 20005

Re: FATA Aluminum, Inc. and FATA Group, S.P.A. v. Vulcan Engineering Co., Inc.
Application No. 01A822

Dear Mr. Ehrenhaft:

The application for an extension of time within which to file a petition for a writ of certiorari in the above-entitled case has been presented to the Chief Justice, who on April 29, 2002, extended the time to and including June 5, 2002.

This letter has been sent to those designated on the attached notification list.

Sincerely,

WILLIAM K. SUTER, Clerk
By
/s/ CLAYTON R. HIGGINS, JR.
Clayton R. Higgins, Jr.
Assistant Clerk

APPENDIX E

CONSTITUTIONAL AND STATUTORY PROVISIONS INVOLVED

U.S. Const. Art. I, § 8, Cl. 8 (Patent Clause):

The Congress shall have Power . . . [t]o promote the Progress of Science and useful Arts, by securing for limited Times to . . . Inventors the exclusive Right to their respective . . . Discoveries.

35 U.S.C. § 101. Inventions patentable

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

35 U.S.C. § 103. Conditions for patentability; non-obvious subject matter

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

* * * * *